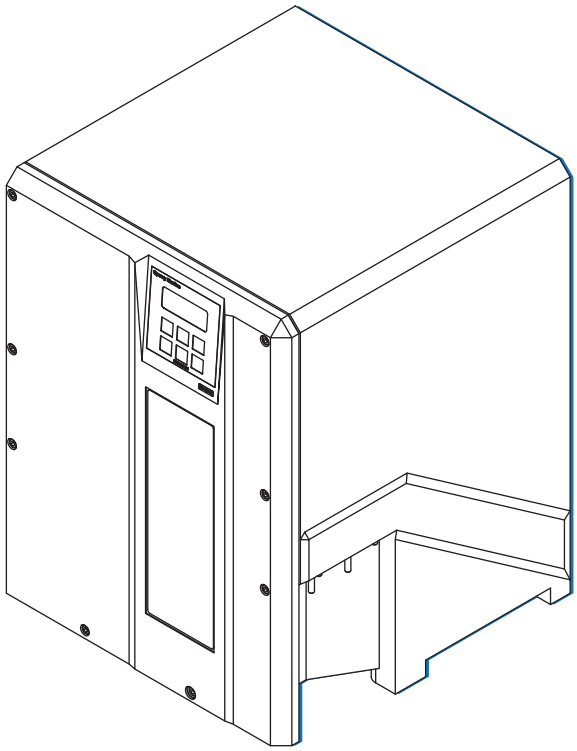
NORTHROP GRUMMAN

Sperry Marine

Operation, Installation and Service Manual

Original Documentation / Keep for Future Reference



NAVIGAT X MK 1

Digital Gyrocompass Systems
Type 4914-CA, Stock No. 74807 and Type 4914-CC, Stock No. 74811
04914-0128-01
056343/D, 11 Sep 2013

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Revision Record

Rev.	Date	Remarks
D	11 Sep 2013	Updated version, new service setup options (Course Bus, THS/HDT, ROT filter) added; technical data amended, checklist procedures added, spare parts added; chapter removal/installation added.
C	08 May 2008	Added new options (AD10 output, alarm mute relay, speed filter).
B	17 Nov 2006	Removed gyrosphere installation/service instructions. These are now contained in separate documents delivered with the respective gyrosphere and container. All information regarding the master PCB refers to the new PCB, stock no. 20672.
A	18 Jan 2005	Initial release.

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Safety Notice Conventions

The following safety notice conventions are followed throughout this manual:

DANGER

A **Danger** notice begins with the named type of danger and contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **will result in injury or death of personnel.**

WARNING

A **Warning** notice begins with the named type of warning and contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in injury or death of personnel.**

CAUTION

A **Caution** notice begins with the named type of caution and contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in damage to, or destruction of equipment.**

Note

A **Note** contains an essential operating or maintenance procedure, condition or statement, which is considered important enough to be highlighted.

Special safety symbols may be used in this manual to indicate:

Risk of electrical shock.
Used in conjunction with a **Danger** or **Warning** notice.

Electrical components sensitive to electrostatic discharge.
Used in conjunction with a **Caution** notice.

General Safety Information for the Operator

WARNING

Risk of deviation
Never rely on one heading source alone to navigate a vessel.
Always confirm the plausibility of the NAVIGAT X MK 1 heading and the speed and position input data against all available aids to navigation.

WARNING

Limited heading data accuracy during settling time
After a power-up from cold, the NAVIGAT X MK 1 requires a settling time of three hours before reliable heading data is available.
Power up the system at least three hours before leaving harbour.
Power down the system during long docking periods only.
Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.
A magnetic compass heading source should be selected as reference only in case of failure of the gyrocompass(es).

WARNING

Risk of misusage
Before using the NAVIGAT X MK 1, operators must be appropriately trained and familiar with all operating procedures and safety instructions contained in this manual. The manual is to be completely read before the first usage of the NAVIGAT X MK 1.
Keep this manual during the entire service life of the product and always have it readily available in a nearby location for reference.

CAUTION

Risk of damage/destruction through low temperatures
The supporting fluid in the gyrosphere container will start freezing at temperatures below 0° C.
The NAVIGAT X MK 1 must no longer be operated when the ambient temperature at the gyrocompass' location falls below - 10° C while the compass is in operation or when the ambient temperature falls below 0° C while the gyrocompass is not in operation.
Always make sure, that the ambient temperature is higher than 0° C respective 10° C. If this is not possible, the gyrosphere container with gyrosphere must be removed from the NAVIGAT X MK 1 and transported to a place with sufficient ambient temperature.
Make sure to remove the gyrosphere from the gyrosphere container if no place with sufficient ambient temperature is available to eliminate damage from freezing supporting fluid. The removal is to be executed in a service work procedure by authorized service personnel only.

CAUTION

Risk of damage through rotating masses
After power-down of the compass system, the gyroscopes need at least 45 minutes to stop rotating. Opening the container or draining off the supporting fluid during rotating will damage the gyrosphere.
Wait at least 45 minutes after power-down of the compass system and make sure, that the gyroscopes have stopped rotating before opening the container or draining off the supporting fluid.

CAUTION

Risk of damage through inadequate cleaning solvents
Do not clean the compass housing with organic solvents, acetone or any other substance which could damage or discolour plastic.
Use only soapy water or a mild detergent to clean the compass housing.

CAUTION

Risk of damage through overheating
A polluted or clogged air inlet grill located at the back side of the compass housing will decrease the functionality of the cooling fan and cause overheating of the gyrocompass.
Always maintain the required distances around the compass housing to enable sufficient air supply and full cooling fan functionality.
Make sure to regularly clean the air inlet grill from dust and dirt and check the fan functionality to avoid overheating.

CAUTION

Risk of damage through unauthorized service
Any service and installation work on the gyrosphere is to be carried out by authorized service personnel only.
Never undertake service or installation work if unskilled for the certain procedure.

CAUTION

Risk of damage through unauthorized service
Only authorized service personnel is allowed to remove the gyrosphere from the gyrosphere container.
Always keep to the mandatory safety requirements and the correct service work procedure to remove the gyrosphere from the gyrosphere container.

CAUTION

Risk of damage through unauthorized service
Only authorized service personnel is allowed to remove gyrocompass system components from the compass housing.
Always keep to the mandatory safety requirements and the correct service work procedures to remove gyrocompass system components from the compass housing.

CAUTION

Risk of damage to the gyrosphere
The gyrosphere is always to be transported in its carrying box in the original transport container.
Do not throw or drop the transport container.
The transport container is to be transported in an upright position only.

CAUTION

Risk of damage to the gyrosphere
Carry the carrying box containing the gyrosphere by hand only and handle it with extreme care.
Remove the gyroshpere from the carrying box only if required for immediate installation.

CAUTION

Risk of data loss through shutdown of the compass / power-off condition
After a shutdown of the compasses main and backup power supplies it cannot be guaranteed that all menu settings remain stored unchanged.
Always check whether the shaft correction angle and alignment error correction values are noted correctly in the setup tables, before switching-off the power supplies, see “Setup and Configuration Tables” on page A-1 Appendix.
Always make sure to separately note the shaft correction angle and alignment error correction values before switching-down the compass for maintenance or repair purposes.

CAUTION

Risk of defective gyrosphere caused by “GYRO FAILURE”
Should a “GYRO FAILURE” alarm occur during power-up, the compass is not working properly.
De-energize the system and visually check the connections to the gyrosphere, the follow-up step motor and the shaft encoder.
If the failure reoccurs when the compass is powered-up again, the installation has not been carried out correctly or the gyrosphere is defective and must be replaced.

CAUTION

Risk of defective gyrosphere
The gyrosphere is not working properly, if after a time period of around 45 minutes after power-up the gyrosphere current has not dropped below approximately 300 mA.
If a visual inspection reveals no obvious cause of malfunction, the power up of the gyrosphere must be repeated.
If after a time period of around 45 minutes after the second power-up the gyrosphere current has still not dropped below approximately 300 mA, the gyrosphere is to be regarded as defective and must be replaced.

CAUTION

Risk of damage through overheating
A polluted or clogged air inlet grill located at the back side of the compass housing will decrease the functionality of the cooling fan and cause overheating of the gyrocompass.
Always maintain the required distances around the compass housing to enable sufficient air supply and full cooling fan functionality.
Make sure to regularly clean the air inlet grill from dust and dirt and check the fan functionality to avoid overheating.

Note

A visual inspection of cables and connectors of the gyrocompass should be carried out regularly to detect any signs of damage or deterioration.

Note

This Operation, Installation and Service Manual 056343 applies only for NAVIGAT X MK 1 systems with the new type master PCB and the PCB transformer on the rear side.
For NAVIGAT X MK 1 systems with the old type master PCB and the PCB transformer on the front side, only the Operation, Installation and Service Manual 056310 is applicable.

Note

In case a „Speed Invalid“ alarm is triggered while the vessel is not in motion or moving very slowly (e.g. when manoeuvring in harbour), this is often caused by fast currents of fairway water increasing the - 5.0 kn minimum speed default value.
In this case, the minimum speed value must be adjusted accordingly.

Note

The access code for the setup menu to reset the gyrosphere operation time counter is disclosed to authorized service personnel only and is not described in this manual.

Note

Sperry Marine Service:
In case of service refer to **www.sperrymarine.com/offices** for a list of all Sperry Marine Offices and Service Agents worldwide.

General Safety Information for Service Personnel

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Make sure that the main and backup power supplies of the compass are always switched off and safeguarded against accidental switching-on before undertaking any removal or installation procedures of the gyrosphere container.

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Be extremely careful when operating the compass while the housing is open. Newer touch the master PCB, the connecting cables to the gyrosphere container or any other conductive components on the container or in the compass housing.
Always exclude any contact to energized components.

DANGER

Life danger through electrical shock
When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
Make sure the compass' main and backup power supplies are always switched off and safeguarded against accidental switching-on when configuring the system for the vessel's AC supply voltage,

CAUTION

Risk of damage/destruction during transport
The gyrosphere is always to be transported in its carrying box in the original transport container.
Do not throw or drop the transport container.
The transport container is to be transported in an upright position only.
Carry the carrying box containing the gyrosphere by hand only and handle it with extreme care. Remove the gyroshpere from the carrying box only if required for immediate installation.

CAUTION

Risk of damage/destruction after power-down
After power-down of the gyrocompass system, it may take up to 45 minutes for the gyroscopes to stop rotating and the gyrosphere is therefore extremely sensible against any movement. Should the gyrosphere touch the wall of the container, the momentum of the rotating gyroscopes will make it topple and damage the centre pin.
Avoid any movement of the gyrocompass system during power-down time. Always be extremely careful in case the gyrosphere container must be handled during power-down time.

CAUTION

Risk of damage of electrostatic-discharge-sensitive components
The NAVIGAT X MK 1 contains electrostatic sensitive components. Electrostatic discharge may permanently damage components.
When servicing the NAVIGAT X MK 1, take considerable precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

CAUTION

Risk of loss of parameter settings through software exchange
It cannot be guaranteed that parameter settings in the User and Setup menus and the entries made in the Magnetic Compass Calibration table are left intact when the software is exchanged.
Before exchanging the system software IC, record all parameter settings to be able to re-enter them manually, if required.

CAUTION

Risk of malfunction through wrong wiring
Wrong wiring, especially as running wires from one side of the compass housing to the other or across the master PCB will cause malfunction.
Always use the cable inlets on both sides of the compass housing for accurate wiring and keep all wires running inside the housing as short as possible.
Always avoid to run wires from one side of the compass housing across to the other.

CAUTION

Risk of earth faults
Wrong wiring of the cable shields makes the cables act as antennas resulting in earth faults.
Always make sure to correctly draw back the cable shields and fasten the cables to avoid earth faults.

Note

In case of earth faults, it is recommended to always check first the cable wiring for correctly connected cable shields.

CAUTION

Risk of ROT filter malfunction
The selected ROT filter setting in the manual settings menu needs additional activation to gain ROT filter functionality
For activating the ROT filter setting in the service setup 1, it is mandatory to pre-install a wire link at the master PCB TB2 19/20.

Note

To make sure, that the ROT damping time constant setting for the analogue ROT output becomes effective, check if the mandatory wire link between the master PCB TB2 19/20 is correctly installed.

CAUTION

Risk of damage through aggressive cleaning agents
Do not clean the compass with organic solvents, acetone or any other substance which could damage or discolour plastic.
Only use water and soap or a mild detergent to clean the compass.

CAUTION

Risk of damage through overheating
A polluted or clogged air inlet grill located at the back side of the compass housing will decrease the functionality of the fan and cause overheating of the gyrocompass.
Always maintain the required distances around the compass housing to enable sufficient air supply and full fan functionality.
Make sure to regularly clean the air inlet grill from dust and dirt and check the fan functionality to avoid overheating.

Note

A visual inspection of cables and connectors of the gyrocompass should be carried out regularly to detect any signs of damage or deterioration.

Note

In case a „Speed Invalid“ alarm is triggered while the vessel is not in motion or moving very slowly (e.g. when manoeuvring in harbour), this is often caused by fast currents of fairway water increasing the - 5.0 kn minimum speed default value.
In this case, the minimum speed value must be adjusted accordingly.

Note

For installation and service procedures of the gyrosphere and gyrosphere container, the following separate Installation, Maintenance and Service Procedures, delivered with the gyrosphere, apply:
- 04911-0125-001, for gyrosphere type 2, gyrosphere container mod. 7/2.
- 04911-0125-002, for gyrosphere type 2, gyrosphere container mod. 10/2
- 05000-0125-001, for gyrosphere type 3, gyrosphere container mod. 10/3.

Note

For recording all parameter settings see “Setup and Configuration Tables” in the appendix of this manual.

Note

The Shaft Correction Angle of the gyrosphere is a specific value for each single item and indicated at the right front corner of the baseplate.

Chapter 1: Introduction

1.1 System Description

Intended Use

The NAVIGAT X MK 1 is a digital gyrocompass system for the maritime navigation of vessels and must be operated only from appropriately trained and educated personnel familiar with all mandatory safety and operating procedures.

The NAVIGAT X MK 1 provides North-speed error corrected true heading data as well as rate of turn (ROT) data for the navigation of maritime vessels.

The NAVIGAT X MK 1 can operate as a standalone system or as part of a multi gyrocompass system environment (Heading Management System, HMS).

Not Intended Use

The NAVIGAT X MK 1 and/or the provided true heading and ROT data of the NAVIGAT X MK 1 are not allowed to be used for the navigation of inland water vessels and river boats. Any exception to this restriction must be regulated by specific certification of an entitled organisation or administration, for further details see certification information under ”Design and Main Features” on page 1-6 and ”Marine Equipment Directive EC Declaration of Conformity” on page 1-14.

Although the NAVIGAT X MK 1 is a highly accurate system for providing true heading and ROT data, operators must not rely on it solely as the only heading source. The plausibility of the NAVIGAT X MK 1 heading and ROT data and the speed and position input data (as secondary data) must always be confirmed against all other available aids to navigation.

Since the NAVIGAT X MK 1 system can additionally be used for displaying secondary navigation data (speed and position input data) generated from other connected devices, the operator must not take displayed secondary data for granted and is obliged to confirm the validity of secondary data independently.

1.2 System Overview and Main Components

Figure 1-1:
NAVIGAT X MK 1 housing

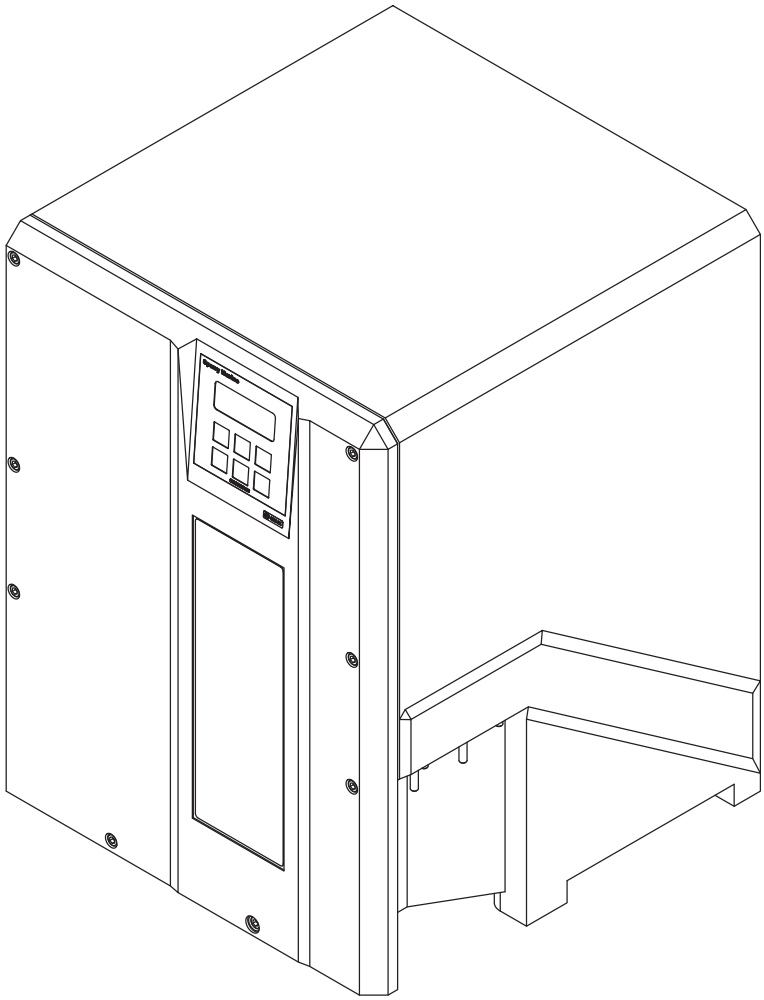
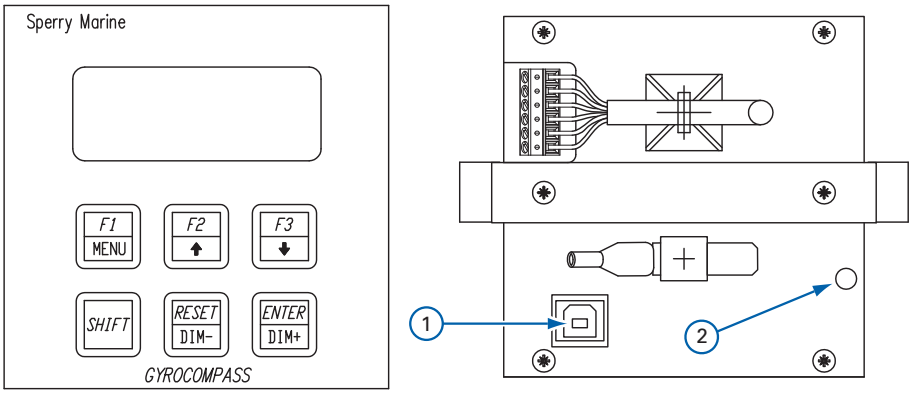


Figure 1-2:
Control and display unit (CDU) front and back view



No.	Item	Qty.
①	USB service interface	1
②	Dimmer	1

Label and type label

Note

The label at the front door shows the power-up sequence and a quick guide to the operation menu for a single NAVIGAT X MK 1 gyrocompass system only.

Figure 1-3: NAVIGAT X MK 1 label

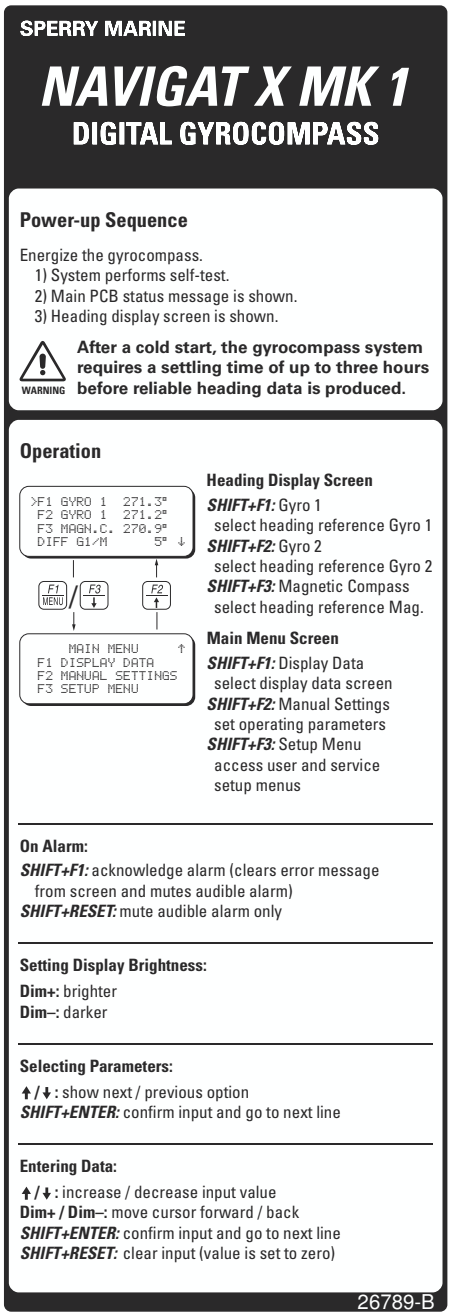
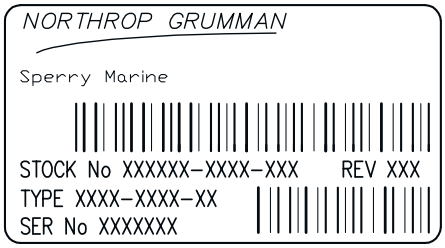
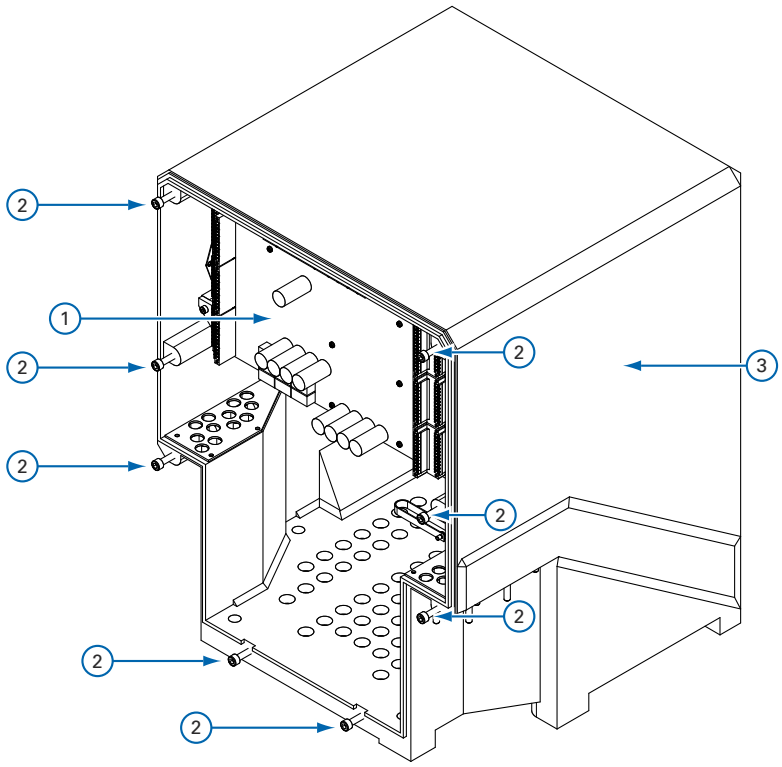

SPERRY MARINE
NAVIGAT X MK 1
DIGITAL GYROCOMPASS
Power-up Sequence
Energize the gyrocompass.
1) System performs self-test.
2) Main PCB status message is shown.
3) Heading display screen is shown.
WARNING
After a cold start, the gyrocompass system requires a settling time of up to three hours before reliable heading data is produced.
Operation
>F1 GYRO 1 271.3°
F2 GYRO 1 271.2°
F3 MAGN.C. 270.9°
DIFF G1/M 5°
F1 MENU
F3
F2
MAIN MENU
F1 DISPLAY DATA
F2 MANUAL SETTINGS
F3 SETUP MENU
Heading Display Screen
SHIFT+F1: Gyro 1 select heading reference Gyro 1
SHIFT+F2: Gyro 2 select heading reference Gyro 2
SHIFT+F3: Magnetic Compass select heading reference Mag.
Main Menu Screen
SHIFT+F1: Display Data select display data screen
SHIFT+F2: Manual Settings set operating parameters
SHIFT+F3: Setup Menu access user and service setup menus
On Alarm:
SHIFT+F1: acknowledge alarm (clears error message from screen and mutes audible alarm)
SHIFT+RESET: mute audible alarm only
Setting Display Brightness:
Dim+: brighter
Dim–: darker
Selecting Parameters:
↑/↓: show next / previous option
SHIFT+ENTER: confirm input and go to next line
Entering Data:
↑/↓: increase / decrease input value
Dim+ / Dim–: move cursor forward / back
SHIFT+ENTER: confirm input and go to next line
SHIFT+RESET: clear input (value is set to zero)
26789-B

Figure 1-4: NAVIGAT X MK 1 type label



Main components

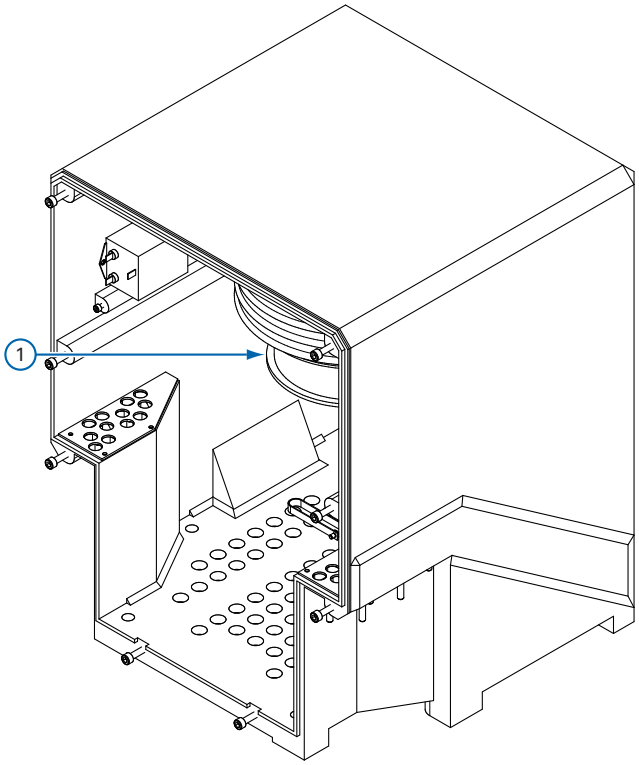
Figure 1-5:
Printed Circuit Board (PCB)



No.	Item	Qty.
①	Master Printed Circuit Board (PCB)	1
②	Hex head screws	8
③	MK1 housing	1

In figure 1-5 the front door is not shown for better understanding.

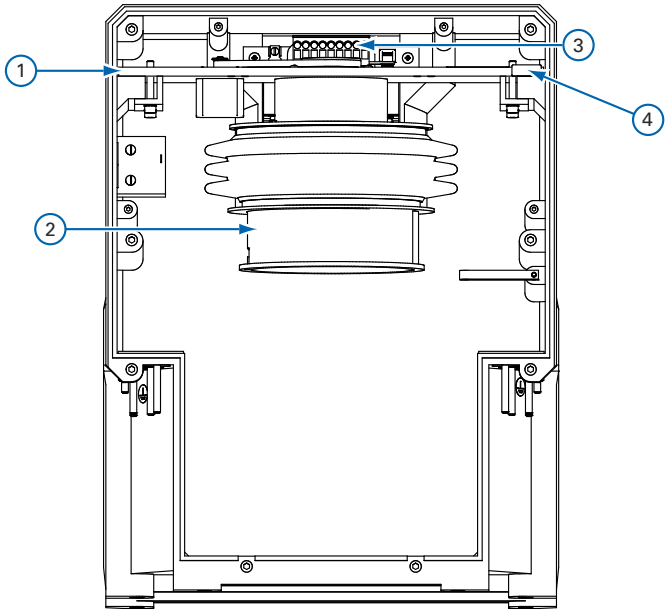
Figure 1-6:
Gyrosphere suspension



No.	Item	Qty.
1	Gyrosphere suspension	1

In figure 1-6 and 1-7 the PCB is not shown for better understanding.

Figure 1-7:
Base plate and gyrosphere suspension



No.	Item	Qty.
1	Base plate	1
2	Gyrosphere suspension	1
3	Main power supply transformer (partly covered)	1
4	Sticker of shaft encoder correction angle value	1

1.3 Design and Main Features

The NAVIGAT X MK 1 is a microprocessor controlled marine gyrocompass system with integrated automatic North speed error correction.

The NAVIGAT X MK 1 has been type approved by Germanischer Lloyd (GL), in accordance with the Marine Equipment Directive (MED) 96/98/EC, as amended, as
gyrocompass (certificate no. 94 418-10 HH),
gyrocompass for high speed craft (HSC) (certificate no. 94 428-10 HH) and rate of turn indicator (ROTI) (certificate no. 94 424-10 HH).

The NAVIGAT X MK 1 Type 4914 CA complies with the following specified standards as gyrocompass:
IMO resolutions A.424(IX), A.694(17), MCS.191(79), ISO 8728(1997, IEC 60945(2002), IEC 62288(2008) and IEC 61162 series.

The NAVIGAT X MK 1 HSC-version Type 4914 CC (stock no. 74811) with a specially selected gyrosphere complies with the following specified standards as gyrocompass for high speed craft (HSC):
IMO resolutions A.821(19), A.694(17), MSC.36(63), MSC.97(73), MSC.191(79), ISO 16328(2001), IEC 60945(2002), IEC 62288 (2008) and IEC 61162 series.

The NAVIGAT X MK 1 Type 4914 CA and NAVIGAT X MK 1 HSC-version Type 4914 CC comply with the following specified standards as rate of turn indicator (ROTI):
IMO resolutions A.526(13), A.694(17), MSC.36(63), MSC.97(73), MSC.191(79), ISO 20672(2007), IEC 60945(2002), IEC 62288(2008) and IEC 61162 series.

The NAVIGAT X MK 1 has been type approved by the
Russian River Register (RRR) for the purpose of provision of navigation safety of inland navigation and river-sea going vessels and has been assigned certificate 190-06-3.1.1.
For further details see “Marine Equipment Directive EC Declaration of Conformity” on page 1-14.

The single unit design with a polyurethane hard foam housing allows the gyrocompass to be installed on any bridge. If required, the operating unit may be installed at a location remote from the compass or an additional remote operating unit may be used.

The unique method of supporting the gyrosphere by means of mere buoyancy ensures North stabilisation during short power failures, e.g., after a three minute loss of power, no more than two degrees of deviation may be expected. Once power has been restored, the gyrocompass will return quickly to the correct heading. The combined effects of the twin rotors and the liquid damping system virtually eliminate latitude error.

Heading is measured as a 13-bit absolute value with a digital shaft encoder. The high-speed follow-up system (follow-up speed up to 100°/s) ensures that accurate heading and rate of turn data is provided under all operating conditions.

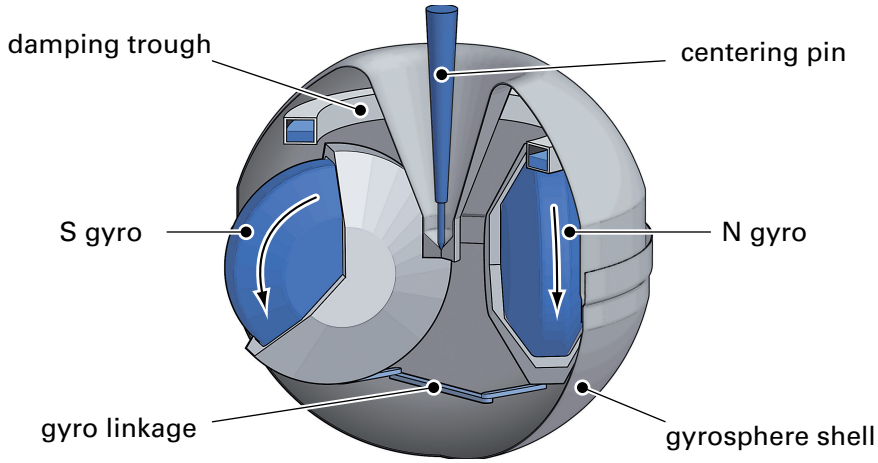
Integrated monitoring of the supply powers, gyroscope current and the follow-up system ensure secure and trouble-free operation.

1.4 Operating Principle

The north-seeking element used in the NAVIGAT X MK 1 system is the gyrosphere, a hermetically sealed unit with a funnel-shaped recess, reaching from the outer skin down to its centre.

Inside the gyrosphere, two mechanically linked gyroscopes are mounted with their spin axes horizontal in a carrying frame. The gyroscopes are allowed to turn around the vertical, but torsion bands effect a defined rest position, while a mechanical linkage ensures that the resultant spin vector of the gyros remains stationary relative to the gyrosphere. This twin gyro arrangement eliminates intercardinal roll error. Once the gyros have run up to speed, their resultant spin vector, and with it the gyrosphere, settles in the direction of true North.

Figure 1-8:
Gyrosphere



The top of the gyrosphere contains an annular damping trough, half filled with a viscous fluid. The fluid damps azimuthal oscillations of the gyroscope system. The oscillation period is tuned to the Schuler period of 84.4 minutes, so that heading errors during horizontal acceleration due to changes in speed and/or direction are prevented.

The gyrosphere floats in a supporting fluid inside the gyrosphere container. Because the buoyancy of the gyrosphere is a little greater than its weight, a bearing cup at the bottom of the recess is pressed against the centering pin and keeps the gyrosphere exactly centered in the container.

In order to make the gyroscope system pendulous, that is, to provide the gravity controlling moment, the gyrosphere is designed so that its centre of gravity lies slightly below the centre of buoyancy.

The gyroscopes are in fact squirrel-cage induction motors, which attain a speed of nearly 20000 rpm at a voltage of 100 VAC @ 337 Hz.
In the Mod. 10/3 container, their supply power is applied through the electrolytically conducting supporting fluid, via the top and bottom contacts. In the Mod. 10/2 and Mod. 7/2 containers, the power is applied via the centering pin and the bottom contacts.

A follow-up control circuit keeps the container aligned with the gyrosphere at all times, thus heading can be derived from the container's orientation.

While systems with the Mod. 10/3 container employ an optical pick off to provide the follow-up control signal, systems with the Mod. 10/2 and Mod. 7/2 containers use a resistance bridge circuit, formed by the conducting paths from the contact pins in the container, through the supporting fluid and to the equator contact of the gyrosphere.

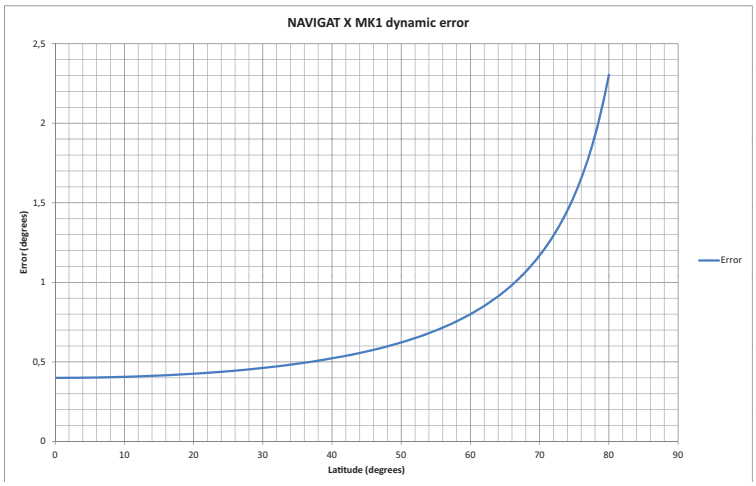
Note

The Mod. 7/2 container and the Mod. 10/2 container (if not refitted for mercury free operation) use mercury for the resistance bridge circuit. Only specially trained personnel is allowed to take care with all handling of mercury and special handling procedures must be maintained. Always keep to the current issue of the mercury handling procedures of Sperry Marine Northrop Grumman, stock no. 026150-0000-000.

Dynamic Heading Error

The adjacent figure 1-9 shows the correlation of dynamic heading error and latitude of the NAVIGAT X MK 1 System.

Figure 1-9:
Dynamic heading error



Correlation of dynamic heading error and latitude (0.4° x sec. lat.)

1.5 Example System Configurations

Standalone Gyrocompass/TMC System

As a standalone system, the NAVIGAT X MK 1 provides North-speed error corrected true heading as well as rate of turn data.

If a fluxgate sensor, type 4863, or an electronic magnetic compass is installed, the NAVIGAT X MK 1 applies magnetic variation and distributes magnetic compass heading data to external equipment (Transmitting Magnet Compass, TMC function).

The heading difference alarm function permits to monitor the difference between the gyrocompass and magnetic compass heading sources.

In case of failure of the gyrocompass, the magnetic compass heading source may be activated to provide an emergency heading reference for repeaters and other peripheral equipment.

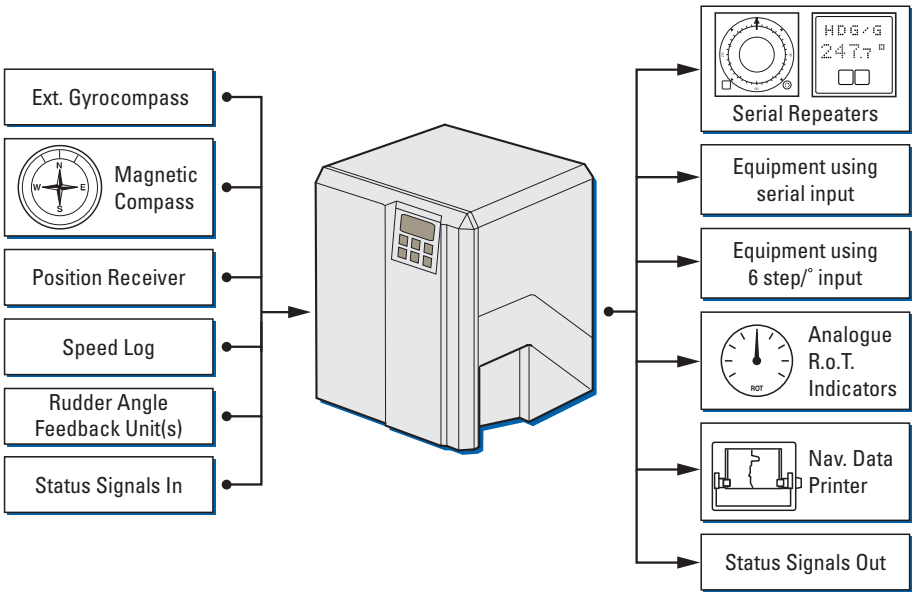


Figure 1-10: Standalone Gyrocompass/TMC system

Dual NAVIGAT X MK 1 Gyrocompass/TMC System

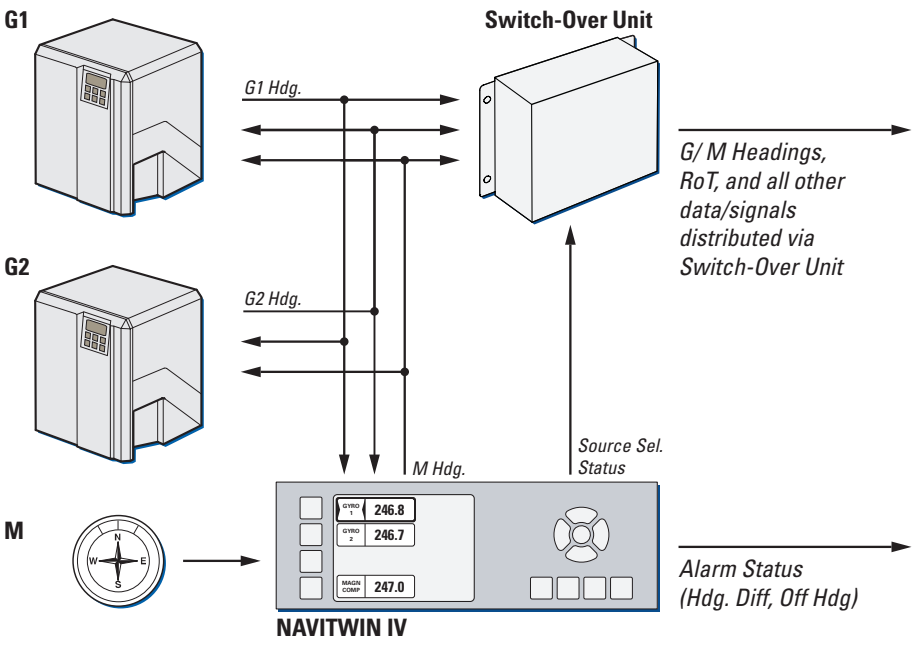
The system shown in figure 1-11 below is the standard configuration for a dual NAVIGAT X MK 1 gyrocompass system.
In addition to the two NAVIGAT X MK 1 gyrocompasses, this system comprises the NAVITWIN IV heading management system (HMS) and the Switch-Over Unit Type 4932.

By selecting the active heading source at the NAVITWIN IV, the operator determines which gyrocompasses' data is distributed via the Switch-Over Unit to external equipment, such as heading control systems, RADAR, compass repeaters etc.

The NAVITWIN's heading diff. alarm function permits to monitor the difference between any two of the available heading sources. The off heading alarm function permits to monitor the difference between the actual heading from the active source and the set heading order, as received from a heading control system or entered manually.

Alarms generated locally by a NAVIGAT gyrocompass are indicated and may be acknowledged at the NAVITWIN IV. In turn, the NAVITWIN IV transmits system-wide operational settings and setup parameters to the NAVIGAT gyrocompasses. The available heading sources, the current source selection and the heading difference alarm threshold (hdg. diff. threshold) are also indicated at both gyrocompasses.
If a magnetic compass heading source is installed, the NAVITWIN applies magnetic variation and distributes the data to external equipment (TMC function). In case of failure of the gyrocompasses, the magnetic compass heading source may be activated to provide an emergency heading reference for repeaters and other peripheral equipment.

Figure 1-11: NAVIGAT Dual Gyrocompass System



Note

A system with one NAVIGAT X MK 1 and one NAVIGAT 2100 / NAVIGAT 3000 fiber-optic gyrocompass is also possible in an otherwise identical configuration.

1.6 Technical Data

Accuracies

heading:	
linear mean settle point error static heading error	≤ 0.1° x secant latitude ≤ 0.1° x secant latitude
dynamic heading error* (range of operation within 70° S to 70° N latitude)	≤ 0.4° x secant latitude
deviation after 3 min. power interruption	< 2°
rate of turn	≤ 0.5°/minute

*The correlation of dynamic heading error and latitude is shown in figure 1-9 on page 1-8

Operational Characteristics

mean setting time	< 3 h
max. follow-up speed	100°/s
freedom of roll and pitch	
- with container Mod. 10 - with container Mod. 7	± 40° ± 90°
mean time between failure (MTBF)	40 000 h

Environmental Requirements

ambient temperature, operation	- 10 to + 55° C
ambient temperature, storage (without supporting fluid)	- 25 to + 70° C
environmental conditions / EMC	in accordance with IEC 60945

Protection Grade

according to IEC 60529/DIN 40050	IP 23

Magnetic Clearance

to standard magnetic compass	0.6 m
to steering magnetic compass	0.4 m
reduced, to standard magnetic compass	0.3 m
reduced, to steering magnetic compass	0.3 m

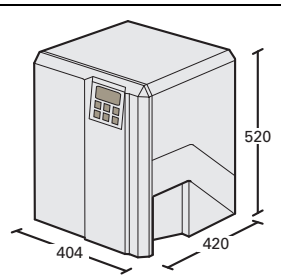
Power Supply

supply voltage	main: 115/230 VAC, 50/60 Hz; backup: 24 VDC (18-36 V), including automatic switch over to backup supply in case of main supply failure
max. ripple content DC supply	± 4 Vpp; extreme values may not exceed 36 V or fall below 18 V

Power Supply

power consumption:	
start-up	AC: 125 VA; DC: 80 W
operation	AC: 75 VA; DC: 45 W
each analogue repeater	AC: 7 VA; DC: 7 W
each digital repeater	AC: 5 VA; DC: 5 W

Dimensions and Weight

width	404 mm	
height	520 mm	
depth	420 mm	
weight	25 kg approx.	

Data Inputs

external gyro heading	NMEA 0183 / IEC 61162-1 or PLATH protocol or Lehmkuhl (1200, 2400, 4800 or 9600 Bd.)
magnetic compass heading	NMEA 0183 / IEC 61162-1 or PLATH protocol or NAVIPILOT
position	NMEA 0183 / IEC 61162-1
speed	NMEA 0183 / IEC 61162-1
compass monitor NAVITWIN (Heading Management System)	NMEA 0183 / IEC 61162-1

Signal and Status Inputs

magnetic compass heading, fluxgate sensor	sine, cosine and reference (ref.) voltages from Sperry Marine fluxgate sensor type 4863
speed, 200 pulse/nm	connection to power ground (P.Gnd) via external contact, momentary
rudder angle feedback unit (2x; reads rudder angle for output to NAVIPRINT)	0 – 5 VDC return voltage from feedback potentiometer
steering mode status (auto/man)	connection to P.Gnd via ext. contact, latching
external heading reference selection. (gyro1/gyro2)	connection to P.Gnd via ext. contact, latching
external heading reference selection. (gyro/mag)	connection to P.Gnd via ext. contact, latching

Signal and Status Inputs

external alarm acknowledge (mute)	connection to P.Gnd via ext. contact, momentary
status input port (log status or heading +180° function)	connection to P.Gnd via ext. contact, latching

Data Outputs

serial repeater outputs (12x TTL)	NMEA 0183
sensor data outputs (4x RS-422; 3 available if AD10 output active)	NMEA 0183 / IEC 61162-1
FAST output (1x RS-422)	NMEA 0183 / IEC 61162-1 or PLATH protocol (update rate 20 Hz)
SuperFAST output (2x RS-422; 1 available if AD10 output active)	NMEA 0183 / IEC 61162-1 or NMEA 0183 / IEC 61162-2 or PLATH protocol (update rate 20 Hz)
AD10 heading data output	AD10 serial data and clock
NAVITWIN output	NMEA 0183 / IEC 61162-1 to external gyro / compass monitor NAVITWIN
NAVIPRINT output	serial data to nav. data printer

Signal and Status Outputs

6 step/° output (2 x)	3 phases, switched to 0 V potential if active („minus switching"), common positive; internal supply 24 VDC max. 18 W (12 – 70 VDC phase voltage when ext. power supply is used)
rate of turn, analogue	± 0.1 – 999.9 mV/°/min; max. 10 V, 10 mA
power failure/general alarm heading difference alarm max. ROT exceeded alarm, heading source selection status status out to switch-over unit watch alarm acknowledge AC power status DC power status	potential-free contact closures, each rated 30 VDC/1.0 A, 100 VDC/0.3 A, 125 VAC/0.5 A

1.7 Marine Equipment Directive EC Declaration of Conformity

Declaration:

Northrop Grumman Sperry Marine B.V.
Woltmanstrasse 19
D-20097 Hamburg, Germany.

as manufacturer hereby declares that the following specified equipment:

"NAVIGAT X MK1 GYROCOMPASS SYSTEM"

complies with the Marine Equipment Directive 96/98/EC, as amended.

This equipment has been tested to verify compliance with the Regulations and Testing Standards as per EC Type Examination (B) and EC Quality System (D) issued by:

Notified Body No. 0098 Germanischer Lloyd.

Note

The current issue of the detailed Marine Equipment Directive EC Declaration of Conformity of Northrop Grumman Sperry Marine B.V. Hamburg is part of the client CD stock no. 56 800.
For further details please contact:
Northrop Grumman Sperry Marine B.V. Hamburg
Regulatory Support Group

Chapter 2: Operation

2.1 Operating Conditions

The permitted ambient temperature for the operation of the gyrocompass system is between - 10° C to + 55° C.

CAUTION

Risk of damage/destruction through low temperatures
The supporting fluid in the gyrosphere container will start freezing at temperatures below 0° C.
The NAVIGAT X MK 1 must no longer be operated when the ambient temperature at the gyrocompass' location falls below - 10° C while the compass is in operation or when the ambient temperature falls below 0° C while the gyrocompass is not in operation.
Always make sure, that the ambient temperature is higher than 0° C respective 10° C. If this is not possible, the gyrosphere container with gyrosphere must be removed from the NAVIGAT X MK 1 and transported to a place with sufficient ambient temperature.
Make sure to remove the gyrosphere from the gyrosphere container if no place with sufficient ambient temperature is available to eliminate damage from freezing supporting fluid.

When the ambient temperature at the gyrocompass' location falls below - 10° C while the compass is in operation or when the ambient temperature falls below 0° C while the compass is not in operation, the gyrosphere container must be removed from the compass housing and stored in a place where the ambient temperature will not fall below 0° C.

Note

For the service procedure to remove the gyrosphere container from the compass housing see "Removing the Gyrosphere Container from the Compass Housing" on page 5-2.

Always be aware, that in case no storage place is available where the ambient temperature will not fall below 0° C, the gyrosphere must be removed by authorized service personnel from the gyrosphere container to prevent possible damage by frozen supporting fluid.

CAUTION

Risk of damage through unauthorized service
Only authorized service personnel is allowed to remove the gyrosphere from the gyrosphere container.
Always keep to the mandatory safety requirements and the correct service work procedure to remove the gyrosphere from the gyrosphere container.

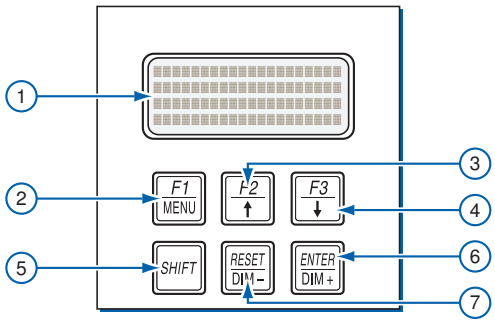
Note

For installation and service procedures of the gyrosphere and gyrosphere container, the following separate Installation, Maintenance and Service Procedures, delivered with the gyrosphere, apply:
- 04911-0125-001, for gyrosphere type 2, gyrosphere container mod. 7/2
- 04911-0125-002, for gyrosphere type 2, gyrosphere container mod. 10/2
- 05000-0125-001, for gyrosphere type 3, gyrosphere container mod. 10/3.

2.2 Display and Operating Keys

Control and Display Unit (CDU)

Figure 2-1:
NAVIGAT X MK 1
control and display unit



Display

① **LCD Display:** 4x20 character text display.
- In normal operational mode: shows the available heading sources and the heading difference alarm threshold.
- In menu mode: displays the currently active operating menu screen.

Operating Keys

② **MENU / F1 key:** Calls up the main menu from normal operational mode. When pressed in menu mode, returns to next higher menu level.
When pressed simultaneously with the **SHIFT** key, the **F1** function is executed.

③ **Up (↑) / F2 key:** In menu mode, returns from the main menu to normal operational mode. Within a sub-menu, scrolls up through available pages on same menu level.
When pressed simultaneously with the **SHIFT** key, the **F2** function is executed.

Down (↓) / F3 key: Calls up the Main Menu from normal operational mode. Within a sub-menu, scrolls down through available pages on same menu level.
When pressed simultaneously with the **SHIFT** key, the **F3** function is executed.

⑤ **SHIFT key:** Pressed with other key to call up key's **SHIFT** function.

⑥ **DIM+ / RESET key:** Adjust the display brightness.
When pressed simultaneously with the **SHIFT** key, the **RESET** function is executed.

⑦ **DIM- / ENTER key:** Adjust the display brightness.
When pressed simultaneously with the **SHIFT** key, the **ENTER** function is executed.

2.3 External Control Devices

Depending on the installation, external devices may be present which remotely control certain functions of the NAVIGAT X MK 1:

- **External device:** An external device may be used to select the "active" source, i.e. the heading reference to be distributed to compass repeaters, heading control system, RADAR, ECDIS etc.
- **External selector:** An external selector switch may be used to reverse the heading (apply a 180° offset to the heading data), e.g. for operation in double-ended ferries.
- **Remote device:** The audible alarm at the NAVIGAT X MK 1 may be muted from a remote device, e.g. a central alarm panel.

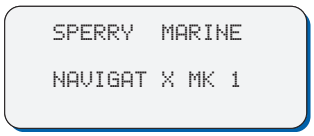
2.4 Power-up Sequence

WARNING

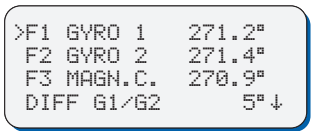
Limited heading data accuracy during settling time
After a power-up from cold, the NAVIGAT X MK 1 requires a settling time of three hours before reliable heading data is available.
Power up the system at least three hours before leaving harbour.
Power down the system during long docking periods only.
Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.
A magnetic compass heading source should be selected as reference only in case of failure of the gyrocompass(es).

The NAVIGAT X MK 1 is not equipped with a power switch. The gyrocompass powers up as soon as supply power is applied.

Upon power up, the startup routine is executed:



A startup screen is shown and a system test sequence is executed.



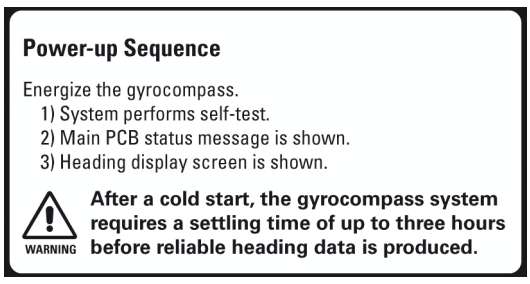
When the system test has been passed, the NAVIGAT X MK 1 enters normal operational mode. The display shows the heading data from the available compasses and the heading difference alarm threshold.

The currently active heading source is indicated by an arrow symbol (>) next to the source's name.

Note

The label at the front door shows a short overview of the power-up sequence with a belonging Warning note for a single NAVIGAT X MK 1 gyrocompass system.

Figure 2-2: Power-up Sequence NAVIGAT X MK 1 label


Power-up Sequence
Energize the gyrocompass.
1) System performs self-test.
2) Main PCB status message is shown.
3) Heading display screen is shown.
WARNING
After a cold start, the gyrocompass system requires a settling time of up to three hours before reliable heading data is produced.

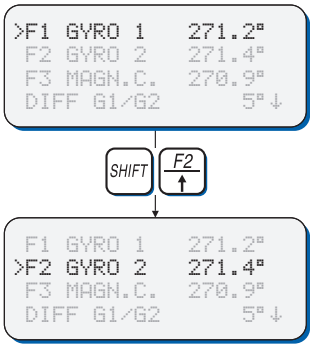
2.5 Selecting the Active Heading Source

WARNING

Limited heading data accuracy during settling time
After a power-up from cold, the NAVIGAT X MK 1 requires a settling time of three hours before reliable heading data is available.
Power up the system at least three hours before leaving harbour.
Power down the system during long docking periods only.
Make sure that the NAVIGAT X MK 1 has settled before using its heading as the reference for heading control systems, RADAR, ECDIS, etc.
A magnetic compass heading source should be selected as reference only in case of failure of the gyrocompass(es).

The operator may select one of the available heading sources as the “active” source, i.e. the heading reference to be distributed to compass repeaters, heading control system, RADAR, ECDIS etc.

Depending on the system configuration, the active heading source is either selected from the NAVIGAT X MK 1 control and display unit (single or dual gyrocompass systems) or from an external device such as a NAVITWIN compass monitor/heading management system, a NAVIPILOT heading control system or an external selector switch.



To change the active heading source from the control and display unit:

- Press the selector key next to the desired source’s heading display.

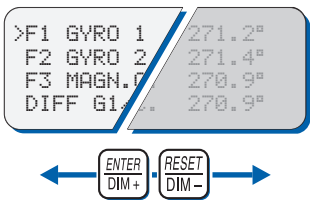
⇒ The selected source is made active.

Note

If the system is configured for source selection from an external device, selection from the control and display unit is disabled.
The active heading source can be changed in a manual steering mode only.
In automatic steering modes, source selection is disabled and an error beep sounds when an attempt is made to change the active source.

2.6 Adjusting the Display Brightness

The brightness of the display and keypad illumination is adjusted via the **DIM+/DIM-** keys:



- Press the **DIM+** key.

⇒ The illumination brightness is increased.

- Press the **DIM-** key.

⇒ The illumination brightness is reduced.

2.7 Optional Functions

The following functions may be available if the system is equipped with the respective external controls and configured accordingly.

Muting Alarms Remotely

On alarm, actuate the mute control at a remote device (e.g. a central alarm panel). The audible alarm is muted.

Note

A remotely muted alarm remains in the pending (unacknowledged) state. The alarm message is shown on the display until the alarm is acknowledged at the NAVIGAT X MK 1 or the cause of the alarm is eliminated.

Reversing the Heading Display (180° offset)

To reverse the heading display, e.g. for operation on double-ended ferries, activate the 180° offset function at the associated external control.

Note

The heading display may be reversed automatically in some installations, e.g. when control is centrally transferred between fore and aft steering stands.

Resetting/Acknowledging a Central Watch Alarm

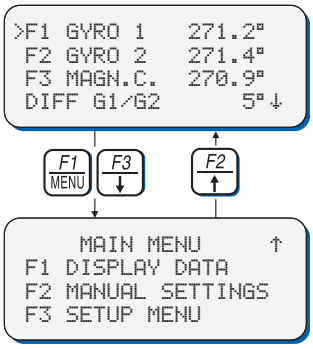
If connected to a central watch alarm facility ('dead man alarm'), the NAVIGAT X MK 1 will automatically reset the watch alarm timer whenever a key is pressed on the unit.

Should a watch alarm be given, pressing any key at the NAVIGAT X MK 1 will acknowledge the alarm and reset the watch alarm timer.

2.8 Operating Menu

The data display menu as well as the manual settings, user and service setup sub-menus are accessed through a multilevel operating menu.

Entering and Quitting the Main Menu



From the normal operational mode, press the **MENU** or the **Down** key to enter the menu mode.

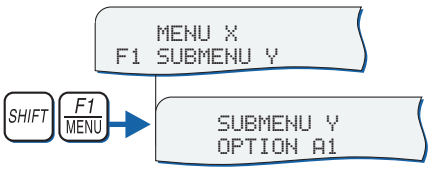
The main menu screen opens.

From the main menu screen, press the **Up** key to return to the normal operational mode.

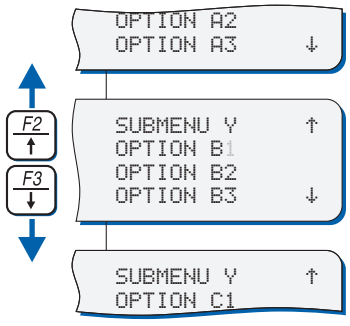
The NAVIGAT X MK 1 returns to normal operational mode.

Navigating the Menu

In the menu mode, the operator may navigate through the menu using the **F1, F2, F3, Up/Down, Dim+/Dim-** and **MENU** key functions.

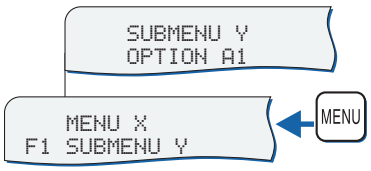


Press **Shift-F1**, **Shift-F2** or **Shift-F3** to go to the respective sub-menu.



Arrow symbols (↑/↓) at the right of the window indicate that further pages are available at the same menu level.

With the **Down** or **Up** key, scroll to the next or previous page respectively.

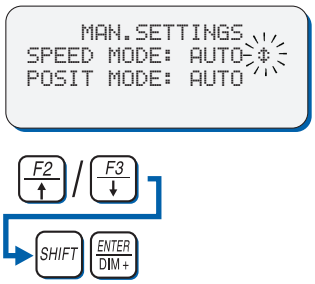


Press the **MENU** key to return to the next higher menu level.

Selecting Parameter Settings

A number of operational and setup parameters are set by selecting the appropriate option from a list.

Flashing up/down arrow symbols to the right of a parameter setting indicate that a selection can be made from a list of options:



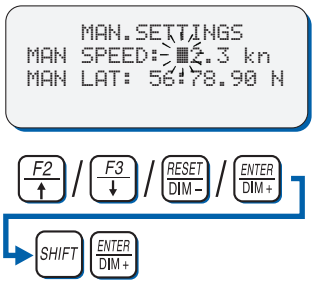
1. With the **Up/Down** keys, select the required option.

- Press **Shift-ENTER** to confirm and store the selection.
- **MENU** leaves the sub-menu without changes.

Editing Parameter Values

A number of operational and setup parameters are set by editing a numerical value.

A flashing box cursor indicates that a parameter's value is editable:

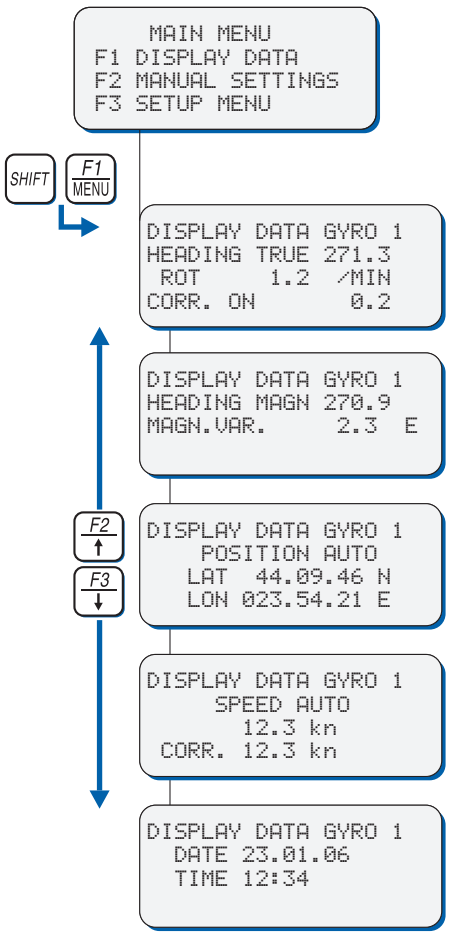


1. With the **Up/Down** keys, edit the character at the current cursor position.
2. With the **Dim+/Dim-** arrow keys, move the cursor forward/back to edit the next/previous character.

- Press **Shift-ENTER** to confirm and store the new value.
- **MENU** leaves the sub-menu without changes.

2.9 Selecting a Display Data Page

The Display Data menu allows the operator to select one out of five pages to permanently display relevant operational data, instead of the normal heading display screen.
The selected page is displayed until another page is selected or the Display Data mode is quit.



1. From the Main Menu, press **SHIFT - F1** to go to the Display Data sub-menu.
2. With the **Up/Down** keys, select the required page to display.

The following data pages are available:

- HEADING TRUE = True heading (own gyro heading);
  ROT = Rate of turn;
  CORR. = Correction mode and value.
- HEADING MAGN = Magnetic compass heading;
  MAGN. VAR.: Magnetic variation.
- Position Mode;
  LAT = Latitude
  LON = Longitude (in auto mode).
- Speed Mode;
  Actual speed value
  CORR. = Speed value used for speed error correction.
- DATE = Date (DD.MM.YY);
  TIME = Time (hh.mm).

2.10 Manual Settings Menu

The Manual Settings menu provides access to settings which the operator may need to alter more or less frequently during normal operation.

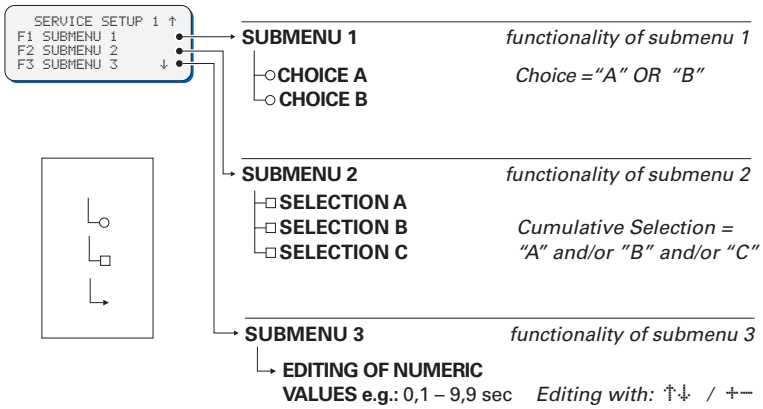
Note

In case a NAVITWIN compass monitor / heading management system is installed, the manual settings must be entered at the NAVITWIN.
The NAVITWIN will overwrite any manual settings entered locally at the NAVIGAT X MK 1 control and display unit.

Caption for Selecting and Editing

Figure 2-3 shows the caption for the different selecting and editing symbols used in all manual setting figures.

Figure 2-3: Caption for choice, selecting and editing



Note

Choice means that either "A" or "B" must be chosen.
Selection means that "A" and/or "B" can be selected cumulatively.
Editing means that numeric values must be edited.

Manual Settings – Overview

Figure 2-4:
Manual Settings

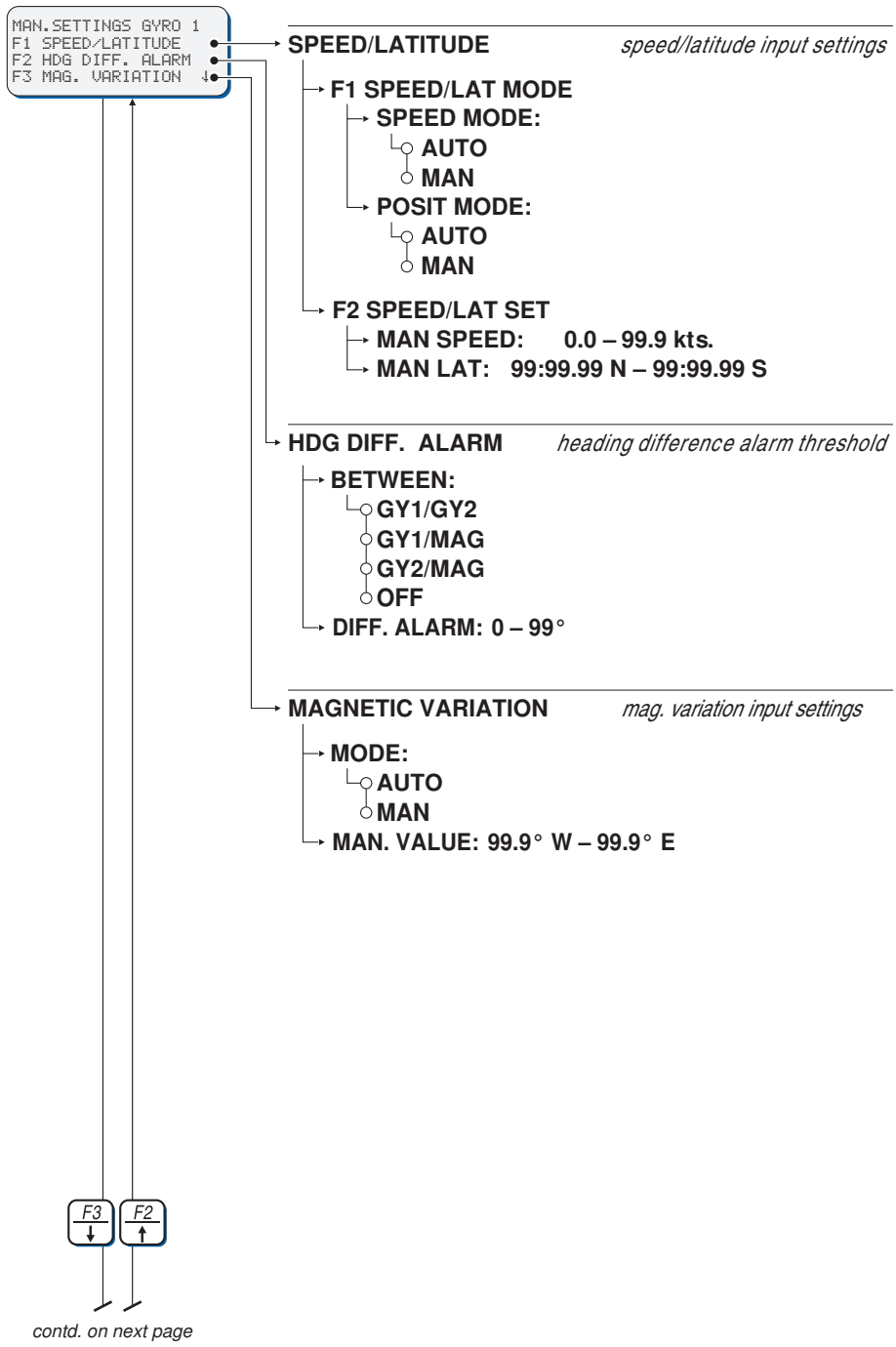
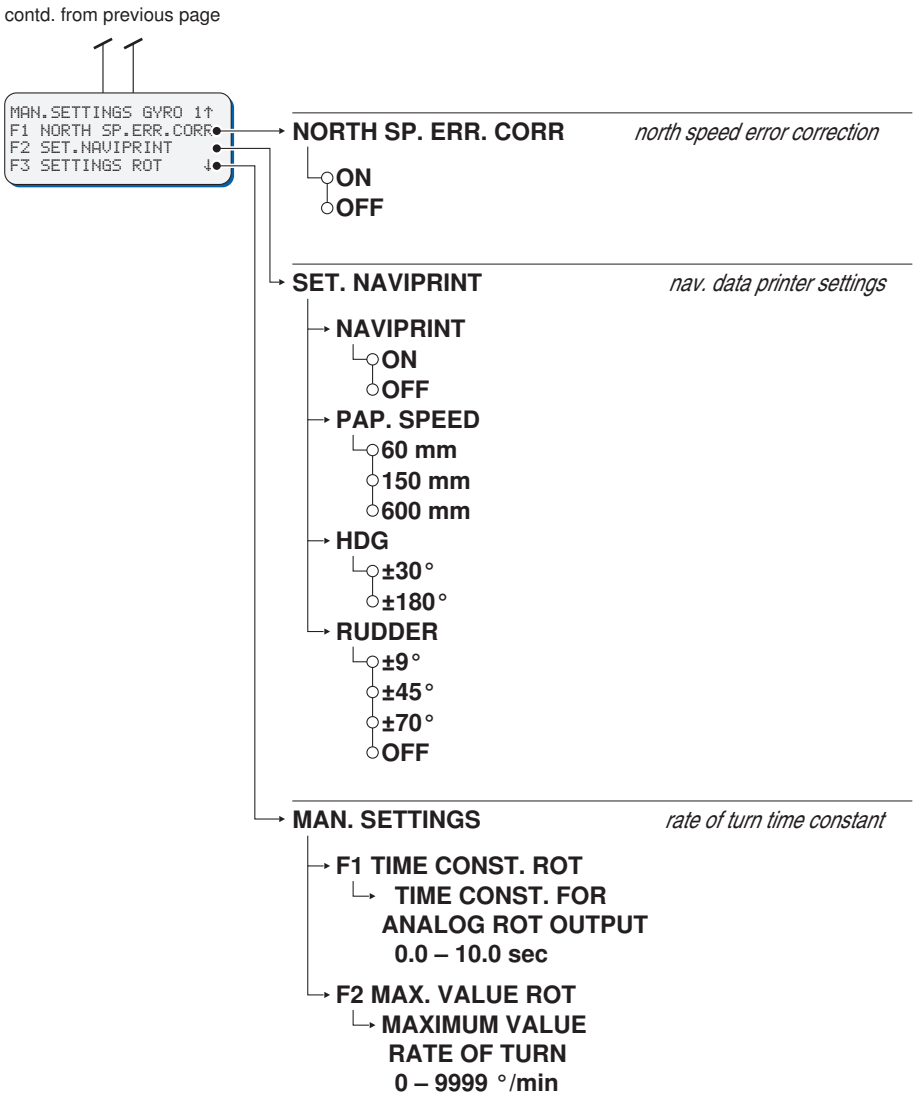


Figure 2-5: Manual Settings (contd.)



Manual Settings – Parameters

SPEED/LATITUDE

SPEED/LAT MODE

Selects the speed and position input modes.

SPEED MODE

Selects the speed input mode.

Settings: **AUTO**
Speed data is read automatically from the serial data or the 200 pulse/nm input

MAN
The actual speed value is entered manually

POSIT MODE

Selects the position input mode.

Settings: **AUTO**
Position data is read automatically from the serial data input

MAN
The actual position is entered manually

SPEED/LAT SET

Sets the manual input values for the speed and latitude.

Settings: **MAN SPEED**
For setting the manual speed input value

MAN LAT
For setting the manual position input value

Values: speed: **0.0 – 99.9 kn**
latitude: **90°00.00′ N – 90°00.00′ S**

HDG. DIFF. ALARM (Heading Difference Alarm)

Sets the manual input values for the heading difference alarm threshold.

BETWEEN
Selects the heading sources to monitor.

Settings: **GY1/GY2**
Monitor difference between gyros 1 and 2 heading

GY1/MAG
Monitor difference between gyro 1 and magnetic compass heading

GY2/MAG
Monitor difference between gyro 2 and magnetic heading.

OFF
Heading difference alarm monitoring is disabled

DIFF. Alarm (Heading Difference Alarm threshold)
Sets the alarm threshold value.

Value: **0 – 99°**

MAGNETIC VARIATION

Sets the magnetic variation input parameters.

MODE
Selects the magnetic variation input mode.

Settings: **AUTO**
Magnetic variation data is read automatically

MAN
The actual magnetic variation value is entered manually

MAN VALUE (manual value)
Sets the manual input value for the magnetic variation.

Value: **99.9° W – 99.9° E**

NORTH SP. ERR. CORR. (North Speed Error Correction)

Selects the North speed error correction mode.

Settings: **ON**
Automatic North speed error correction is enabled.

OFF
Automatic North speed error correction is disabled.

SET. NAVIPRINT

Sets the operating parameters for the NAVIPRINT navigation data printer.

NAVIPRINT
Turns printing on and off.

Settings: **ON**
Activate output to printer

OFF
No output to printer

PAP. SPEED (paper speed)
Sets the paper feed speed.

Settings: **60 mm**
print at 60 mm/h (1 cm = 10 min.).

150 mm
print at 150 mm/h (1 cm = 4 min.)

600 mm
print at 600 mm/h (1 cm = 1 min.)

HDG (heading)
Sets the scaling of the heading graph.

Settings: **± 30**
scale to show 30° to the left and to the right from the graph's centre (current print position shifts to centre when graph reaches margin)

± 180°
scale to show 180° to the left and to the right from the graph's centre (current print position shifts to the centre when graph reaches margin)

RUDDER
Sets the scaling of the rudder angle graph.

Settings: **± 9°**
scale to show 9° to the left and to the right from the graph's centre. This setting provides a high-resolution recording of small rudder movements and is useful for monitoring e.g. the steering behaviour of an autopilot.

± 45°
scale to show ± 45°. Standard setting for ± 45° steering gears.

± 70°
scale to show ± 70°. Standard setting for ± 70° steering gears.

OFF
do not print rudder angle graph. Required setting if no rudder angle feedback unit is connected to the compass.

MAN. SETTINGS (manual ROT settings)

Sets the parameters for the analog rate of turn output.

CAUTION

Risk of ineffective manual ROT damping settings
The selected ROT damping time constant for the analogue ROT output in the manual settings menu needs additional activation to become effective by means of a wire link installed at the master PCB TB2 19/20.

Note

To make sure, that the ROT damping time constant setting for the analogue ROT output becomes effective, check if the mandatory wire link between the master PCB TB2 19/20 is correctly installed.

TIME CONST. ROT / TIME CONST. FOR ANALOG ROT OUTPUT
Sets the ROT damping time constant value for the analogue rate of turn output. The larger the time constant, the less short-time fluctuations will be present in the analogue rate of turn output voltage.

Value: **0.0 – 10.0 sec**

Typical values are generally between 2 to 4 sec. (only effective if wire link TB2 19/20 at the master PCB is installed)

Note

Following IMO requirements, the ROT damping time constant value for the analogue rate of turn output can be selected between 0.0 to 10.0 sec. All selected values above 10.0 sec will not be accepted by the menu and „ERR" is displayed for showing that the selected value is not valid.

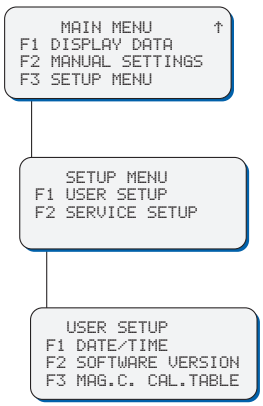
MAX. VALUE ROT / MAXIMUM VALUE RATE OF TURN
Sets the alarm threshold for the "Max. Rate of Turn exceeded" alarm.

Value: **0.0 – 6000 °/min.**

2.11 User Setup

The User Setup menu provides access to settings which the operator may need to alter occasionally.

To access the User Setup:



Call up the Main Menu
Press **Shift-F3** to select "Setup Menu".

Press **Shift-F1** to select "User Setup".

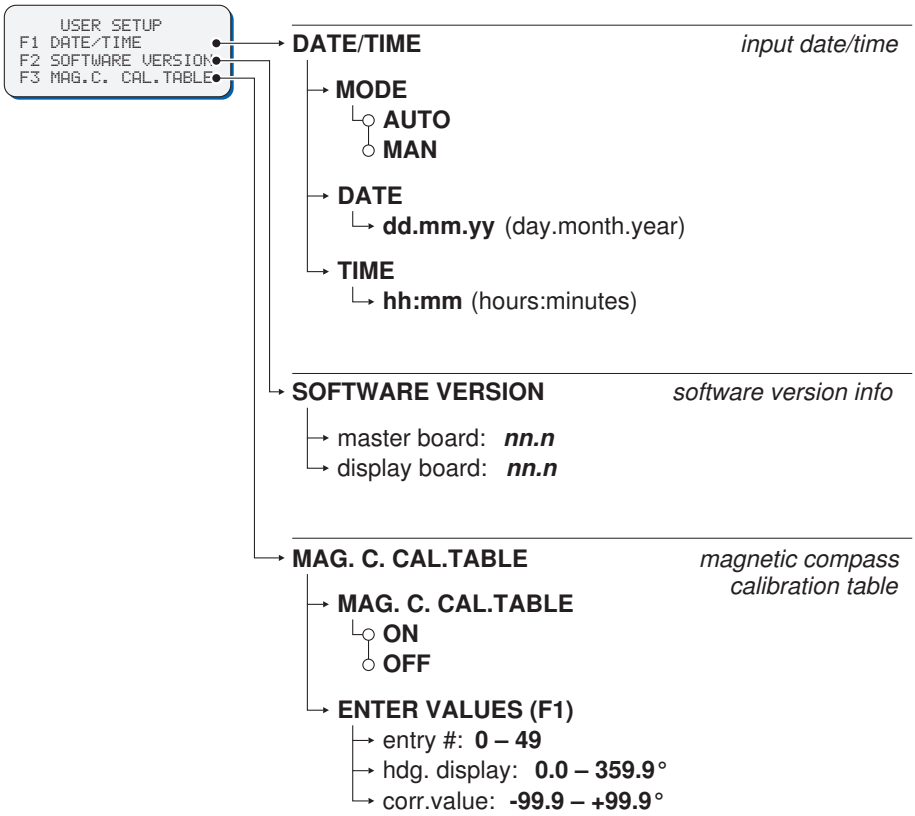
The User Setup sub-menu opens.

User Setup – Overview

Note

The caption for the different selecting and editing symbols used in all user setup menus is identical with the caption symbols used in the manual settings as described in figure 2-3 on page 2-10.

Figure 2-6: User Setup



User Setup – Parameters

DATE/TIME

Sets the date and time input parameters.

MODE
Selects the date and time input mode.

Settings: **AUTO**
Date/time are read automatically from the serial data input

MAN
The current date and time are entered manually

DATE
Sets the current date manually.

Value: **DD.MM.YY** (current date in format day.month.year)

TIME
Sets the current time manually.

Value: **hh:mm** (current time in format hours:minutes)

Note

If manual input is used, date and time must be set again after each power-up.

SOFTWARE VERSION

Displays the master and display board software version info.

Settings: *none*
The software version sub-menu is read-only.

MAG. C. CAL. TABLE (magnetic compass calibration table)

Sets the parameters for the magnetic compass calibration table.

MAG. C. CAL. TABLE
Switches the automatic magnetic compass heading correction on or off.

Settings: **ON**
Automatic correction is enabled

OFF
Automatic correction is disabled

Note

The Magnetic Compass Calibration Table shall only be switched on for automatic magnetic compass heading correction if a magnetic compass is really connected via a fluxgate sensor to the NAVIGAT X MK 1 system.

ENTER VALUES (F1)
Enters the correction values into the magnetic compass calibration table.

Values: *max. 50 pairs of heading and correction values*

Chapter 3: Errors and Alarms

3.1 Alarm Indication

Audible Alarm Indication

Single Beep: Invalid Action

A single short beep indicates that the operator attempted to carry out an invalid action.
This is the case, e.g. if the operator tries to change the heading reference in an automatic steering mode or to activate a heading source from which no valid data is received.

Continuous Beeping: Pending Alarm

Continuous on-off beeping indicates that a pending (unacknowledged) alarm is present.
Simultaneously, an alarm message is displayed.

Visual Alarm Indication

In case of a pending alarm, an alarm message is shown on the display which specifies the type of alarm present.

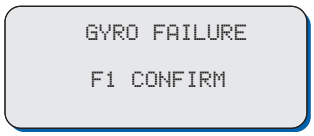


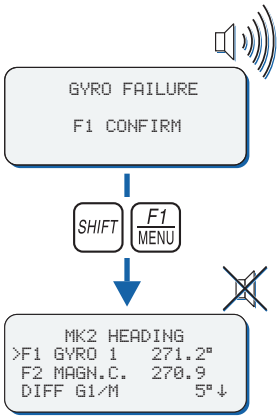
Figure 3-1: Alarm message (gyro failure)

The message remains on the screen until the operator acknowledges the alarm or the cause of the alarm is no longer present.

3.2 Acknowledging Alarms/Muting the Audible Alarm

Alarm Acknowledge

To acknowledge a pending alarm at the NAVIGAT X MK 1:



Press **Shift-F1**.

⇒ The alarm message is cleared and the audible alarm is muted.

As long as the cause of the alarm is present, the alarm remains “active”.

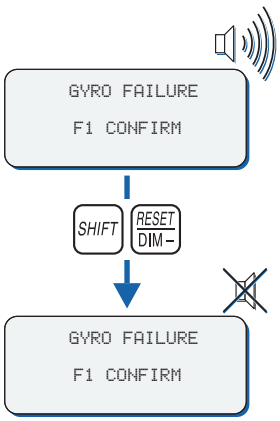
The currently active alarms may be viewed in the error list in the ‘Service Setup 2 – Overview” on page 3-6.

Note

When an alarm has been acknowledged, the external alarm status output remains active until the cause of the alarm is eliminated.
When the cause of an alarm is eliminated, the alarm is acknowledged automatically and the alarm status is cleared.
The NAVIGAT X MK 1 does not keep a history of past (inactive) alarms. Active alarms are only kept temporarily in an error list (see table 3-1 on page 3-3) as long as the alarm remains active.

Alarm Mute

To mute the audible alarm at the NAVIGAT X MK 1:



Press **Shift-Reset**.

⇒ The audible alarm indication is muted.

The visible alarm indication is not cleared and the alarm remains in the pending state until it is acknowledged by the operator.

3.3 Error messages

The following table lists the error messages which may appear on the display and in the error list when a system alarm is active.

Table 3-1: Error messages

Message on Display	Message in Error List	Cause	Corrective Action
GYRO *N* FAILURE *(N = number of own gyro ID)*	FAILURE GYRO *N*	The system cannot provide gyro heading. Possible causes are: • defects of the gyrosphere, the follow-up system or the shaft encoder. • a defect of the hard- or software on the master PCB.	1. If failed gyro is active heading source, activate another source, if available. 2. Restart the gyrocompass system. 3. If the error persists, call an authorized Sperry Marine service station.
GYRO *N* FAILURE *(N = number of external gyro ID)*	FAILURE GYRO *N*	Loss of data from external gyro heading source.	1. If failed gyro is active heading source, activate another source, if available. 2. Check ext. gyro heading source and interface.
MAGN. COMPASS ERROR	FAILURE MAGN.	Loss of magnetic-compass heading data from external source.	Check magnetic compass heading source and interface.
MAGN.VAR .INVALID	MAGN.VAR . INVALID	Loss of magnetic compass variation data (if automatic input active)	Check magnetic compass variation source and interface.
SPEED ERROR	FAILURE SPEED	Loss of speed data from external source.	Check speed data source and interface.

Message on Display	Message in Error List	Cause	Corrective Action
SPEED INVALID	SPEED INVALID	Actual speed outside of valid speed range (invalid speed will not be used for North speed error correction) When triggered while vessel is not moving, the set minimum speed (default) value is increased by fast currents of fairway water	1. Check speed data source and interface. 2. Check current speed filter parameters in Service Setup, 'see "SPEED FILTER" on page 8-17 3. If required, increase valid speed range and/or increase filter time constant
POSITION ERROR	FAILURE POS.	Loss of position data from ext. source.	Check position data source and interface.
HEADING DIFF. ALARM	HEAD. DIFF ALARM	The monitored heading sources differ by more than the set alarm threshold.	Check heading sources to determine cause of the difference.
MAX ROT EXCEEDED	MAX ROT EXCEEDED	Max. Rate of Turn alarm threshold exceeded. Alarm reminds the operator not to exceed preset threshold during turns.	Prevent vessel from turning too fast or increase threshold if unwanted alarms are given.
FAILURE AC SUPPLY	FAILURE AC SUPPLY	Loss of power from main supply.	Check AC main power supply.
FAILURE DC SUPPLY	FAILURE DC SUPPLY	Loss of power from backup supply.	Check DC backup power supply.
RECOMMENDED ANNUAL MAINTENANCE DUE! (see manual)	OPERATION TIME	Alarm given at power-up if more than 18 months have passed since last gyrosphere maintenance	Acknowledge alarm. System will power-up normally. To ensure trouble-free operation, it is highly recommended to have maintenance carried out every 18 months.
NT COM FAULT	NT COM FAULT	Loss of input data from compass monitor NAVITWIN	Check NAVITWIN and interface

3.4 Service Info Menu - Service Setup 2

The Service Setup 2 provides access to system status information which is used during installation and for troubleshooting errors.

Furthermore, an option is provided to reset the system without interruption of the power supply (warm start). For details see “RESET MK 1” on page 3-7.

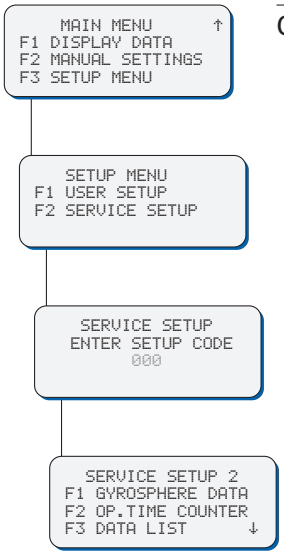
Note

For Service Setup 1 see “Configuration Menu - Service Setup 1” on page 8-1.
The numbering of Service Setup 2 and Service Setup 1 is for differentiation only and says nothing about the hierarchy of the menus.

Service Setup 2 – Access Code

To prevent inadvertent or unauthorized changes to the system configuration, all service setup menus are protected by access codes.

To access the Service Setup 2:



Call up the Main Menu
Press **Shift-F3** to select "Setup Menu".

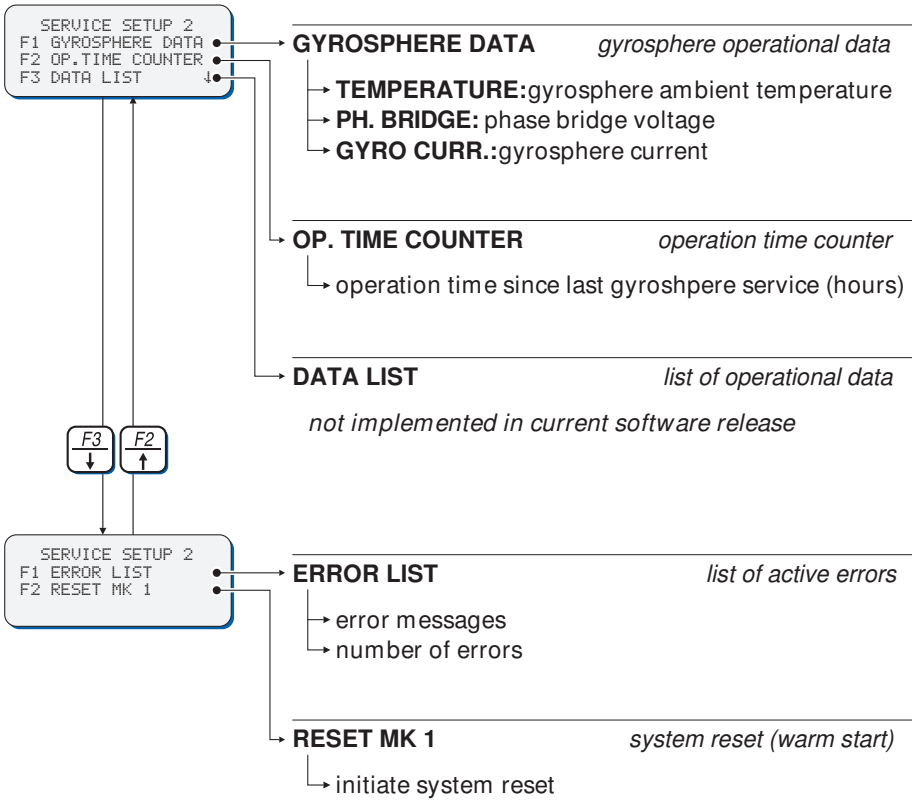
Press **Shift-F2** to select "Service Setup".

When prompted for the setup code:
Enter code "**610** "
Press **Shift-ENTER** to confirm the code.

The Service Setup 2 sub-menu opens.

Service Setup 2 – Overview

Figure 3-2:
Service Setup 2



Service Setup 2 – Parameters

GYROPSPHERE DATA

Displays the gyrosphere operating data.

Displays: **TEMPERATURE**
The ambient temperature around the gyrosphere container.

PH. BRIDGE (phase bridge)
The follow-up circuit phase bridge voltage.

GYRO CURR. (gyro current)
The gyrosphere current.

OP. TIME COUNTER (operation time counter)

Displays the operation time counter of the gyrosphere.

Displays: **Operation time in hours since last gyrosphere maintenance.**
The operation time counter is reset to zero by field service personnel during gyrosphere maintenance.

DATA LIST

The data list is not implemented in the current software version.

ERROR LIST

Displays the currently active system alarms.

Displays: **Error messages**
The display alternates through the message texts of all active alarms. If no errors are present, "No Errors" is displayed.

No. of errors
Displays the total number of active errors.

RESET MK 1

Initiates a system reset (warm start).

The system reset (warm start) is equivalent to powering the system down and up again with the exception that the power supply is not interrupted.

Chapter 4: Scheduled Maintenance

4.1 Maintenance of the NAVIGAT X MK 1

The NAVIGAT X MK 1 requires no scheduled maintenance procedures to be carried out by shipboard personnel or service personnel.

Note

A visual inspection of cables and connectors of the gyrocompass should be carried out regularly to detect any signs of damage or deterioration.

Cleaning of Compass Housing

CAUTION

Risk of damage through aggressive cleaning agents
Do not clean the compass with organic solvents, acetone or any other substance which could damage or discolour plastic.
Only use water and soap or a mild detergent to clean the compass.

The display front plate and the gyrocompass housing should be kept clean by using only water and soap or a mild detergent.

Note

A visual inspection of cables and connectors of the gyrocompass should be carried out regularly to detect any signs of damage or deterioration.

Cleaning of Air Inlet Grill

CAUTION

Risk of damage through overheating
A polluted or clogged air inlet grill located at the back side of the compass housing will decrease the functionality of the fan and cause overheating of the gyrocompass.
Always maintain the required distances around the compass housing to enable sufficient air supply and full fan functionality.
Make sure to regularly clean the air inlet grill from dust and dirt and check the fan functionality to avoid overheating.

Sperry Marine recommends to regularly clean the air inlet grill of the fan and to check the functionality of the fan with every gyrosphere maintenance interval latest, as this is mandatory to avoid overheating of the gyrocompass.

An immediate exchange of the NAVIGAT X MK 1 fan is mandatory in case the fan is found in improper condition.

A default exchange of the fan is recommended in a three years interval.

4.2 Gyrosphere Maintenance

CAUTION

Risk of damage through misusage
Scheduled maintenance or service work on the gyrosphere is to be carried out by authorized service personnel only.

Note

The gyrosphere and the gyrosphere container are the only components of the NAVIGAT X MK 1 which require regular maintenance.

Note

For installation and service procedures of the gyrosphere and gyrosphere container, the following separate Installation, Maintenance and Service Procedures, delivered with the gyrosphere, apply:
- 04911-0125-001, for gyrosphere type 2, gyrosphere container mod. 7/2
- 04911-0125-002, for gyrosphere type 2, gyrosphere container mod. 10/2
- 05000-0125-001, for gyrosphere type 3, gyrosphere container mod. 10/3.

18-Month Maintenance

Sperry Marine recommends to have a regular gyrosphere maintenance carried out by authorized service personnel every 18 months. During the 18-month maintenance, the gyrosphere and the inner surface of the container are cleaned and all fluids are renewed. If necessary, the centering pin is exchanged.

Note

If more than 18 months have passed since the last gyrosphere maintenance, a reminder message is displayed every time the gyrocompass is powered up.
This message indicates no malfunction but is intended to remind the operator that the recommended maintenance interval has been exceeded.
When the reminder message is acknowledged, the gyrocompass will power-up and commence normal operation. During the gyrosphere maintenance, the gyrosphere operation time counter is reset.

Five-Year Maintenance

To ensure continued trouble-free operation and to minimize the risk of failure, Sperry Marine recommends that every five years, the gyrosphere and the centering pin are exchanged by authorized service personnel.

Note

The five-year exchange interval for the gyrosphere is to be regarded as a recommendation only. Under normal conditions, the gyrosphere is able to operate flawlessly over a considerably longer period of time.

Chapter 5: Preventive Maintenance

5.1 Protecting the Gyrosphere from Low Temperatures

CAUTION

Risk of damage/destruction through low temperatures
The supporting fluid in the gyrosphere container will start freezing at temperatures below 0° C.
The NAVIGAT X MK 1 must no longer be operated when the ambient temperature at the gyrocompass' location falls below - 10° C while the compass is in operation or when the ambient temperature falls below 0° C while the gyrocompass is not in operation.
Always make sure, that the ambient temperature is higher than 0° C respective 10° C. If this is not possible, the gyrosphere container with the gyrosphere must be removed from the NAVIGAT X MK 1 and transported to a place with sufficient ambient temperature.
Make sure to remove the gyrosphere from the gyrosphere container if no place with sufficient ambient temperature is available to eliminate damage from freezing supporting fluid. The removal is to be executed in a service work procedure by authorized service personnel only.

The permitted ambient temperature for the operation of the gyrocompass system is from - 10° C to + 55° C.

When the ambient temperature at the gyrocompass' location falls below - 10° C while the compass is in operation or when the ambient temperature falls below 0 °C while the compass is not in operation, the gyrosphere container must be removed from the compass housing and stored in a place where the ambient temperature will not fall below 0° C.

Removal and storage of the container as a whole (with the gyrosphere installed), as well as later re-installation of the container may be carried out by shipboard personnel.

Always be aware, that in case no storage place is available where the ambient temperature will not fall below 0° C, the gyrosphere must be removed by authorized service personnel from the gyrosphere container to prevent possible damage by frozen supporting fluid.

CAUTION

Risk of damage through unauthorized service
Only authorized service personnel is allowed to remove the gyrosphere from the gyrosphere container.
Always keep to the mandatory safety requirements and the correct service work procedure to remove the gyrosphere from the gyrosphere container.

Note

For installation and service procedures of the gyrosphere and gyrosphere container, the following separate Installation, Maintenance and Service Procedures, delivered with the gyrosphere, apply:
- 04911-0125-001, for gyrosphere type 2, gyrosphere container mod. 7/2.
- 04911-0125-002, for gyrosphere type 2, gyrosphere container mod. 10/2
- 05000-0125-001, for gyrosphere type 3, gyrosphere container mod. 10/3.

5.2 Removing the Gyrosphere Container from the Compass Housing

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Make sure that the main and backup power supplies of the compass are always switched off and safeguarded against accidental switching-on before any removal or installation procedures of the gyrosphere container.

CAUTION

Risk of data loss through shutdown of the compass / power-off condition
After a shutdown of the compasses main and backup power supplies it cannot be guaranteed that all menu settings remain stored unchanged.
Always check whether the shaft correction angle and alignment error correction values are noted correctly in the setup tables, before switching-off the power supplies, see "Setup and Configuration Tables" on page A-1 Appendix.
Always make sure to separately note the shaft correction angle and alignment error correction values before switching-down the compass for maintenance or repair purposes.

CAUTION

Risk of damage/destruction after power-down
After power-down of the gyrocompass system, it may take up to 45 minutes for the gyroscopes to stop rotating and the gyrosphere is therefore extremely sensible against any movement. Should the gyrosphere touch the wall of the container, the momentum of the rotating gyroscopes will make it topple and damage the centre pin.
Avoid any movement of the gyrocompass system during power-down time. Always be extremely careful in case the gyrosphere container must be handled during power-down time.

CAUTION

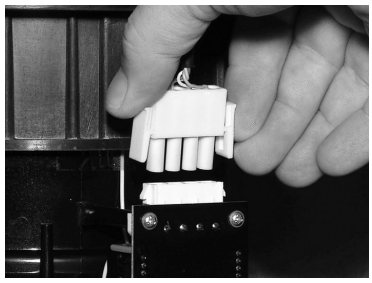
Risk of damage/destruction through transport/wrong storing
When the container with the gyrosphere installed is temporarily stored away, pack it into its original transport box or another suitable outer package.
Always make sure that:
- the container is stored in an upright position,
- the temperature at the storage location cannot fall below 0°C,
- the container is not moved, tilted or subjected to shock.

Parts, materials and tools required

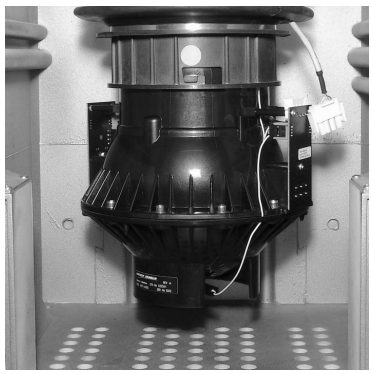
- 5 mm hex key
- No. 2 Phillips-head screwdriver

Procedure[1]

1. Check and note the shaft encoder correction angle and alignment error correction values. Double check whether the shaft encoder correction angle and alignment error correction values are correctly noted in the setup tables.
2. Switch off the compasses main and backup power supplies and take all the necessary precautions to make sure that the compasses main and backup power supplies remain switched off during any removal and installation procedures.
3. Unscrew the 5 mm hex-head screws of the compass housing door and take off the door from the housing.
4. Disconnect the grounding strap between door and housing. Place the door aside. If the door is put next to the housing, the CDU cable may be left connected to the master PCB.



5. Unplug the gyrosphere supply and pick off connector from its socket on the pick off PCB.

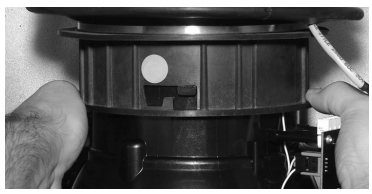


6. Turn the bellows, until the largest of the three coupling seats in the bayonet collar points towards the front of the housing.

Note

The largest of the three coupling seats is marked by a green dot on the collar.

7. Put both hands around the container and lift it up, so that the coupling tongues disengage from their seats in the bayonet.



8. While supporting the container with both palms, put the thumbs on the rim of the collar, pull down on it and turn it to the left

1. Illustrations show the Mod. 10/3 gyrosphere container. All instructions equally apply to the Mod. 10/2 and Mod. 7/2 container.

9. Gently lower the container. The coupling tongues slide down in the grooves of the bayonet and the container is released from the collar.

10. Carefully remove the container from the housing and remove it, while holding it closely with both hands, to its storage location.
11. At the storage location, carefully place the container into its original transport box or another suitable outer package.
12. Clearly label the packaged container and store it safely in an upright position, making sure that it cannot be moved, tilted or subjected to shock.
13. Put the door in front of the housing and reconnect the grounding strap.
14. Fit the door back on the housing and tighten the hex head screws.

Note

Take the necessary precautions to make sure that the compasses main and backup power supplies remain switched off while the container is not installed.

5.3 Installing the Gyrosphere Container in the Compass Housing

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Make sure that the main and backup power supplies of the compass are always switched off and safeguarded against accidental switching-on before any removal or installation procedures of the gyrosphere container.

CAUTION

Risk of damage/destruction after power-down
After power-down of the gyrocompass system, it may take up to 45 minutes for the gyroscopes to stop rotating and the gyrosphere is therefore extremely sensible against any movement. Should the gyrosphere touch the wall of the container, the momentum of the rotating gyroscopes will make it topple and damage the centre pin.
Avoid any movement of the gyrocompass system during power-down time. Always be extremely careful in case the gyrosphere container must be handled during power-down time.

CAUTION

Risk of damage/destruction through transport / wrong storing
When the container is temporarily stored away with the gyrosphere installed, pack it into its original transport box or another suitable outer package.
Always make sure that:
- the container is stored in an upright position,
- the temperature at the storage location cannot fall below 0° C,
- the container is not moved, tilted or subjected to shock.

Parts, materials and tools required

- 5 mm hex key
- No. 2 Phillips-head screwdriver

Procedure[1]

1. Control if the compasses main and backup power supplies are switched off. Take all the necessary precautions to make sure that the compasses main and backup power supplies remain switched off during any removal and installation procedures.
2. At the storage place, carefully unpack the gyrosphere container and take it to the compass' location.
3. Unscrew the 5 mm hex-head screws of the compass housing door and take off the door from the housing.

1. Illustrations show the Mod. 10/3 gyrosphere container. All instructions equally apply to the Mod. 10/2 and Mod. 7/2 container.

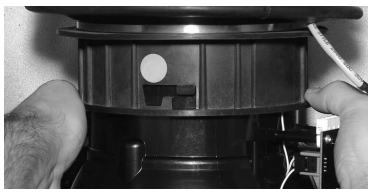
4. Disconnect the grounding strap between door and housing. Place the door aside. If the door is put next to the housing, the CDU cable may be left connected to the master PCB.
5. Gently turn the bellows, until the largest of the three coupling seats in the bayonet collar points towards the front of the housing.

6. Place the gyrosphere container into the compass housing with the largest of the three coupling seats located directly below the groove in the collar.

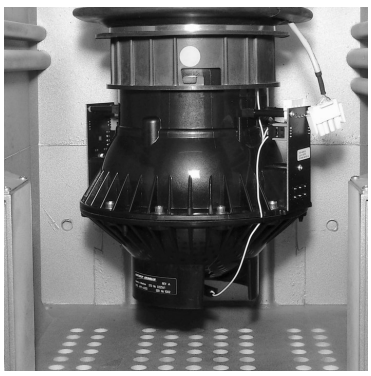
Note

The largest of the three coupling seats is marked by a green dot on the collar.

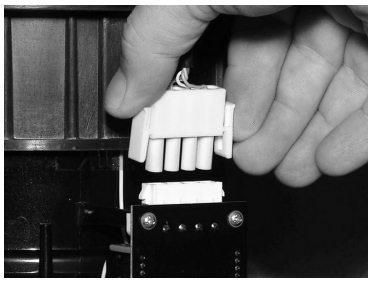
7. Put both hands around the container and lift it into the collar, so that the coupling tongues slide into the corresponding grooves in the bayonet.



8. While supporting the container with both palms, put the thumbs on the rim of the collar, pull down on it and turn it to the right



9. Gently lower the container. The coupling tongues engage into their seats in the bayonet and the container locks in place by its own weight.



10. Plug the gyrosphere supply and pick off connector into its socket on the gyrosphere container.
11. Check that the gyrosphere container turns freely around the vertical.

12. Put the door in front of the housing, so that the keys can be operated. If the CDU cable has been disconnected during gyrosphere installation, reconnect it.

⇒ The gyrocompass is now ready to be put into operation.

Note

Leave the housing door open to observe the settling of the gyrosphere. Proceed with the 'Power-up function test" as described below.

5.4 Power-up Function Test

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Be extremely careful when operating the compass while the housing is open. Never touch the master PCB, the connecting cables to the gyrosphere container or any other conductive components on the container or in the compass housing.

To verify the correct operation of a re-installed gyrosphere, the settling behaviour of the compass is to be observed, with the front door of the compass housing opened.

Note

For a present operating voltage of 100 VAC on the master PCB, 105 VAC true RMS are necessary.
The setting of true RMS can be adjusted via the potentiometer on the master PCB. For details see figure 5-3 on page 5-10.

Gyrosphere Current Preliminaries

The value of the gyrosphere current is decreasing continuously and is a key indicator for a successful gyrosphere settling at a given point of time during the power-up function test.

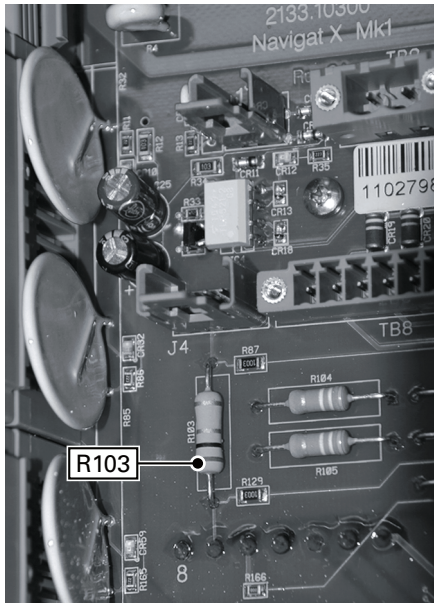
The true value of the gyrosphere current can directly be measured at the 1 Ω gyro current test resistor (R103) of the master PCB.

Note

The AC-voltage in mV across the test resistor (R103) equals the gyrosphere current in mA.

Figure 5-1 on page 5-8 shows the location of the 1 Ω gyro current test resistor (R103).

Figure 5-1:
Location of gyro current test resistor (R103)



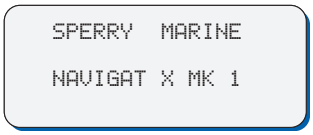
The 1 Ω gyro current test resistor (R103) is located at the left side of the master PCB close beneath the J4 connector and TB8.

Parts, materials and tools required

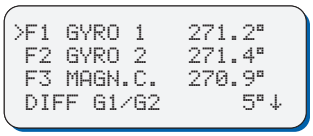
- Trimmer adjustment tool
- Multi meter true RMS

Procedure

1. Power up the compass system.



A startup screen is shown and a system test sequence is executed.



When the system test has been passed, the compass enters normal operational mode. The display shows the heading data from the available compasses and the heading difference alarm threshold.

– In case of a first-time installation where the basic configuration has not been carried out yet, alarms will be given at this point. Alarms caused by missing input data or an incomplete system configuration may be safely acknowledged to continue with the power-up function test.

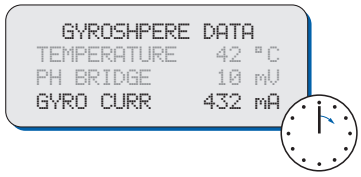
CAUTION

Risk of defective gyrosphere caused by “GYRO FAILURE”
Should a “GYRO FAILURE” alarm occur during power-up, the compass is not working properly.
De-energize the system and visually check the connections to the gyrosphere, the follow-up step motor and the shaft encoder.
If the failure reoccurs when the compass is powered-up again, the installation has not been carried out correctly or the gyrosphere is defective and must be replaced.

2. Observe the settling of the gyrosphere:
   - The gyro motors will create a spinning noise which slowly but constantly rises in pitch until the rotors reach their final speed.
   - The follow-up system will turn the container quickly around the gyrosphere until the optical pick off “locks” onto the motion of the gyrosphere. From then on, the container will engage in a slow oscillatory motion around the vertical, following the motion of the gyrosphere.
   - The amplitude and speed of this motion will steadily decrease until the gyrosphere finally settles.
3. During the settling phase, periodically call up the gyrosphere data sub-menu from the Service Setup 2 (code 610), to observe the gyrosphere current:

Note

The gyrosphere current can as well directly be measured at the 1 Ω gyro current test resistor (R103) on the master PCB, location shown in figure 5-1 on page 5-8.

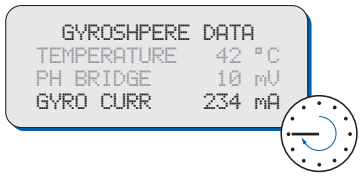


Directly after power-up, the gyrosphere current should not exceed 550 mA. The current will gradually fall while the gyrosphere settles.

Note

20 minutes after power-up a considerable fall of the gyrosphere current should have occurred.

- Check 20 minutes after power-up wether a considerable fall of the gyrosphere current has occurred.



Within around 45 minutes after power-up, the gyrosphere current should have dropped below approximately 300 mA.

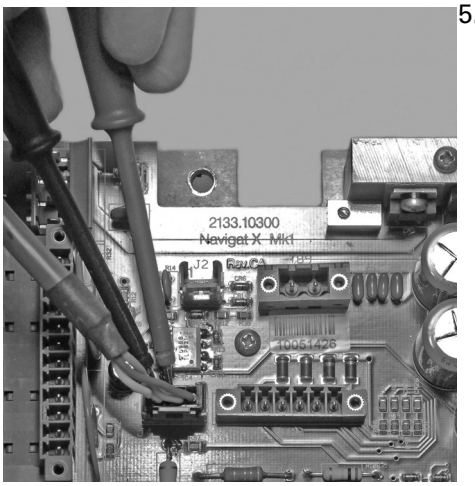
- Check if after around 45 minutes after power-up whether the gyrosphere current has dropped below approximately 300 mA.

4. If after around 45 minutes after the power-up, a gyrosphere current above approximately 300 mA is still displayed in the gyrosphere data sub-menu, the value should be reconfirmed:
   - Measure the gyrosphere current directly at the 1 Ω gyro current test resistor (R103) on the master PCB, the location of the test resistor (R103) is shown in figure 5-1 on page 5-8.

Note

The AC-voltage in mV across the test resistor (R103) equals the gyrosphere current in mA.

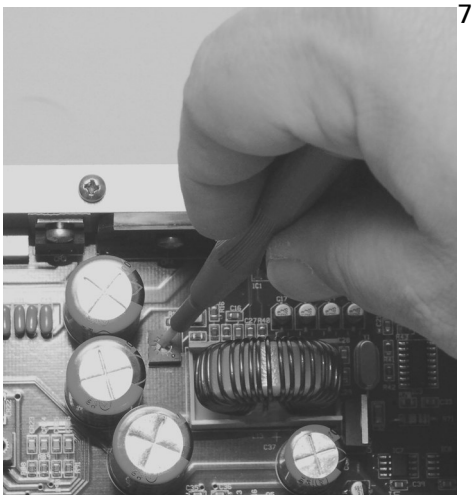
Figure 5-2: Measurement of VAC true RMS at J4



5. Measure the VAC true RMS at pins 1 and 2 (wires white and brown) of the J4 connector on the NAVIGAT X MK1 master PCB.

6. In case the reconfirmed values for the gyrosphere current, directly measured at the 1 Ω gyro current test resistor (R103) on the master PCB, are as well above approximately 300 mA, the VAC true RMS value needs to become adjusted.

Figure 5-3: Adjustment of true RMS at potentiometer R36 on the MK1 master PCB



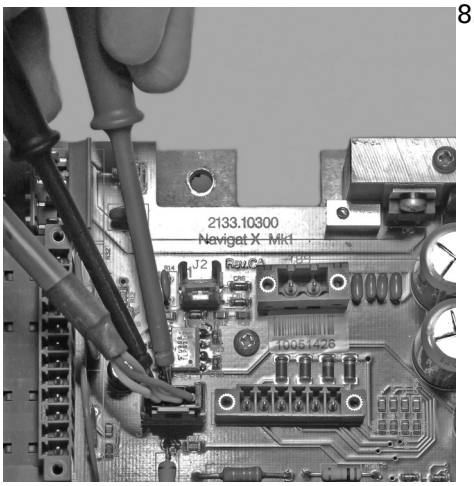
7. Adjust the potentiometer (R36) on the NAVIGAT X MK1 master PCB with a trimmer adjustment tool to set 105 VAC true RMS.

   ⇒ Be careful not to damage the potentiometer (R36).

Note

A regular screwdriver is not recommended for the adjustment of the potentiometer (R36/R9) as these are sensible components.

Figure 5-4:
Measurement of VAC true RMS at J4



8. Measure again the VAC true RMS at the pins 1 and 2 (wires white and brown) of the J4 connector on the NAVIGAT X MK1 master PCB.

CAUTION

Risk of defective gyrosphere
The gyrosphere is not working properly, if after a time period of around 45 minutes after power-up the gyrosphere current has not dropped below approximately 300 mA.
If a visual inspection reveals no obvious cause of malfunction, the power up of the gyrosphere must be repeated.
If after a time period of around 45 minutes after the second power-up the gyrosphere current has still not dropped below 300 mA, the gyrosphere is to be regarded as defective and must be replaced.

⇒ If the current is still above approximately 300 mA, the gyrosphere is not working properly.

9. For a visual inspection of the gyrosphere to find any obvious cause of malfunction, see “Gyrosphere Maintenance” in the Installation, Maintenance and Service Procedures, 05000-0125-01 for details.
10. If a visual inspection reveals no obvious cause of malfunction, repeat the complete power-up procedure and check again if after around 45 minutes after the second power-up the gyrosphere current has dropped below approximately 300 mA.

⇒ If the current is still above approximately 300 mA, after around 45 minutes after the second power-up, and no other obvious cause of malfunction is found, the gyrosphere is to be considered in none operable working condition and to be exchanged.

⇒ If after around 45 minutes after the second power-up the gyrosphere current has dropped below approximately 300 mA, the gyrosphere is to be considered to be in operable working condition.

11. After a settling time of at least 4 hours, verify that the gyrocompass has settled to the correct heading.

Note

The 4 hours settling time for the alignment is only mandatory in case of a first time installation of the NAVIGAT X MK 1.

Note

To verify the gyrocompass’ heading, the actual true heading of the vessel should be known with an accuracy of ± 0.1°.

- Check whether the setting of the shaft encoder correction value in the Service Setup 1 of manual 056343 matches with the value indicated on the baseplate.
- In case of a first time installation, check that the heading shows the correct value approximately, taking into account any existing misalignment of the gyrocompass. Then, set the alignment error correction value in the Service Setup 1 as required, see “Alignment Error Correction” of manual 056343 for details. After the alignment error correction value has been set, the gyrocompass is to display the vessel's true heading with an accuracy of ± 0.5°.
- In case of maintenance or replacement of the gyrosphere, the displayed heading should now already be accurate within ± 1.0°. If necessary, adjust the stored alignment error correction value, so that the gyrocompass displays the vessel's true heading with an accuracy of ± 0.5°, see “Storing the magnetic compas heading calibration table” of manual 056343 for details.

12. In case of a regular maintenance, or if a defective gyrosphere has been replaced, a special service setup menu must now be called up to reset the gyrosphere operation time counter.

Note

The access code for the setup menu to reset the gyrosphere operation time counter is disclosed to authorized service personnel only and is not described in this service procedures.

Chapter 6: Removal/Installation of Components

CAUTION

Risk of damage through unauthorized service
Only authorized service personnel is allowed to remove gyrocompass system components from the compass housing.
Always keep to the mandatory safety requirements and the correct service work procedures to remove gyrocompass system components from the compass housing.

Note

This chapter describes removal and installation procedures of the NAVIGAT X MK 1 system components. For a complete removal of all system components from the compass housing, the gyrosphere container must be removed beforehand.
The removal and installation procedures of the gyrosphere container are described separately in chapter 'Preventive Maintenance´.

Note

All CDU pictures within this chapter show the old type CDU without the USP service interface at the back side, see "Control and display unit (CDU) front and back view" on page 1-2 for new type details.

6.1 Removing System Components from the Compass Housing

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Make sure that the main and backup power supplies of the compass are always switched off and safeguarded against accidental switching-on before any removal or installation procedures of the gyrosphere container.

CAUTION

Risk of damage of electrostatic-discharge-sensitive components
The NAVIGAT X MK 1 contains electrostatic sensitive components. Electrostatic discharge may permanently damage components.
When servicing the NAVIGAT X MK 1, take considerable precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

Parts, materials and tools required

- 5 mm hex key
- 3 mm hex key
- No. 2 Phillips-head screwdriver

Procedure

1. Check and note the shaft encoder correction angle and alignment error correction values. Double check whether the shaft encoder correction angle and alignment error correction values are correctly noted in the setup tables.
2. Make sure that the compasses main and backup power supplies are switched off.

Note

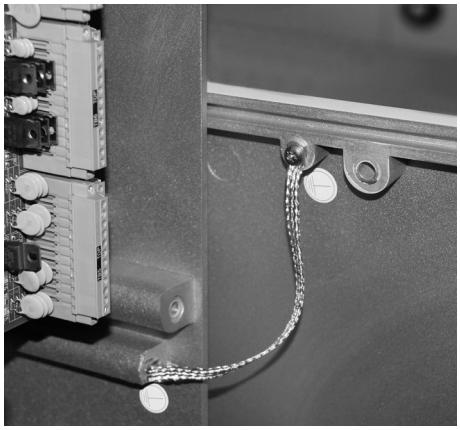
Take all the necessary precautions to make sure that the compasses main and backup power supplies remain switched off during any removal and installation procedures.

3. Unscrew the 5 mm hex-head screws of the compass housing door.

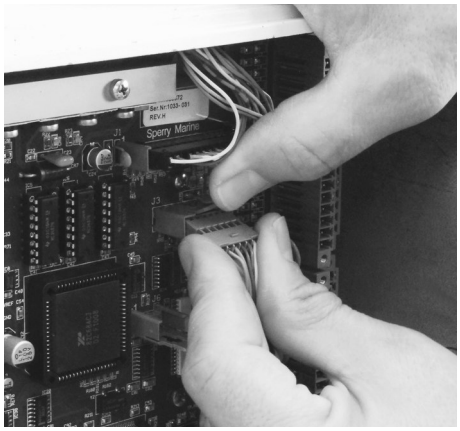
4. Continue until all 5 mm hex-head screws are released.

5. Take off the door from the compass housing.

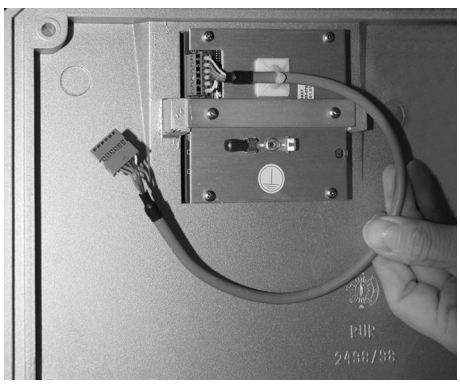
6. Place the door aside.



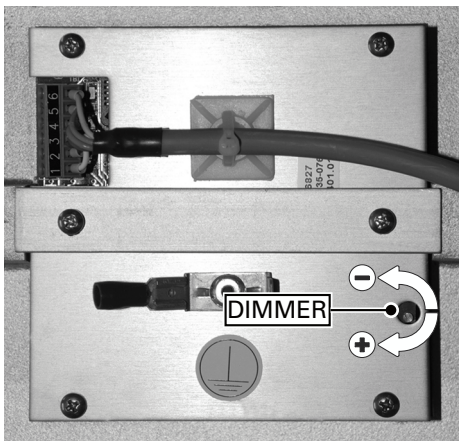
7. If the door is put next to the housing, the grounding strap may be left connected to the compass housing.



8. Bend the retaining plate of the J3 plug connector away and unplug the J3 connector of the CDU cable.

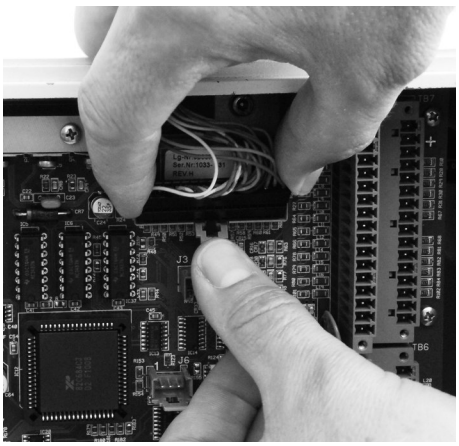


Back front of CDU with CDU cable and released J3 connector.

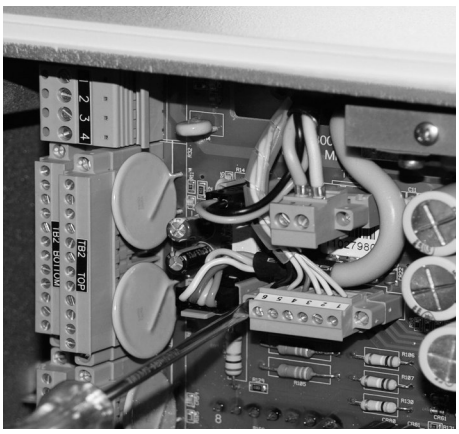


Adjacent picture shows the dimmer settings of the CDU display.

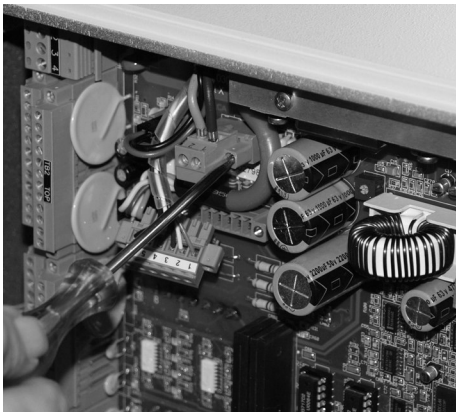
⇒ The new type CDU with the additional USB service interface is shown in figure 1-2 on page 1-2.



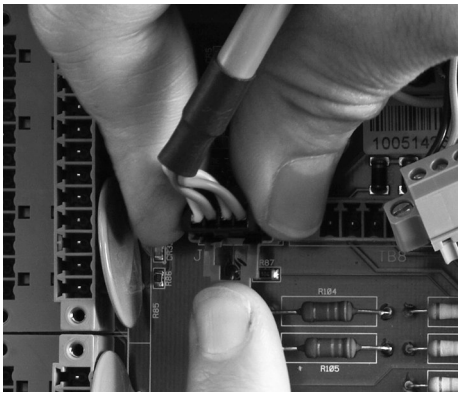
9. Bend the retaining plate of the J1 plug connector away and unplug the J1 connector of the shaft encoder cable.



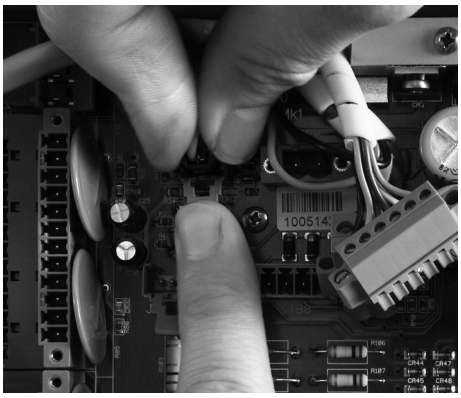
10. Unscrew the screws of the TB 8 plug connector and release the TB 8 plug connector of the follow-up step motor cable.



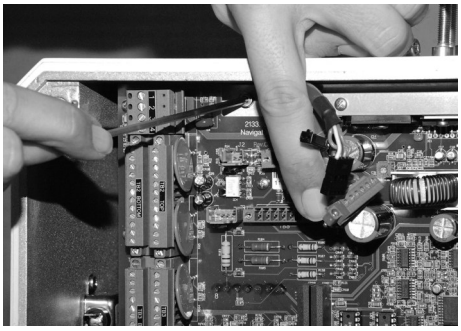
11. Unscrew the screws of the TB 9 plug connector and release the TB 9 plug connector of the main power supply transformer cable.



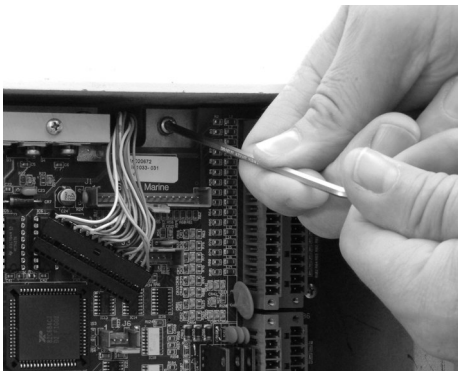
12. Bend the retaining plate of the J4 plug connector away and unplug the J4 connector of the gyrosphere power supply and pick off contacts cable.



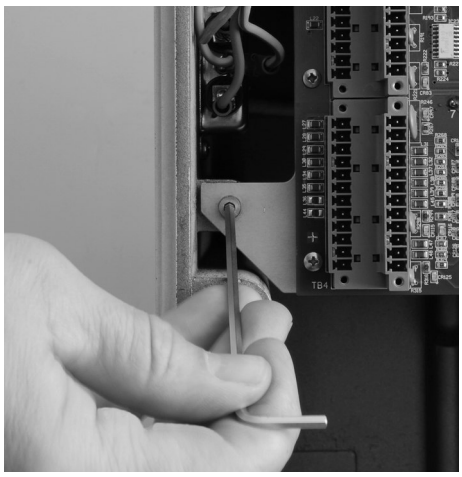
13. Bend the retaining plate of the J2 plug connector away and unplug the J2 connector of the cooling fan cable.



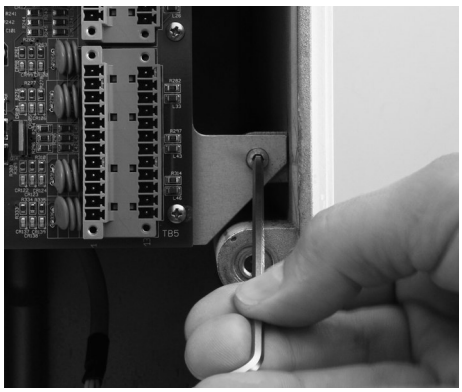
14. Unscrew the upper left 3 mm hex-head screw of the master PCB.



15. Unscrew the upper right 3 mm hex-head screw of the master PCB.

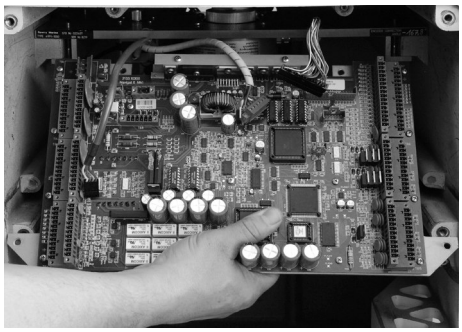


16. Unscrew the lower left 3 mm hex-head screw of the master PCB.



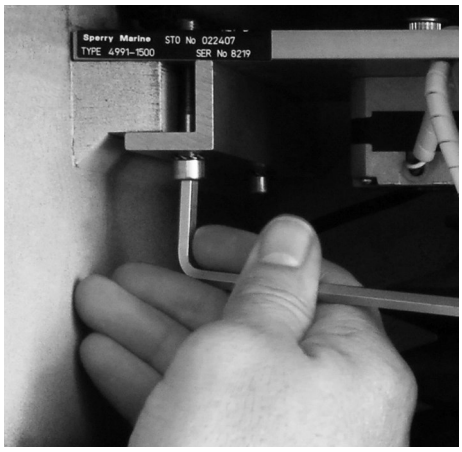
17. Unscrew the lower right 3 mm hex-head screw of the master PCB.

⇒ Hold the master PCB with the other hand to prevent it from falling outside.



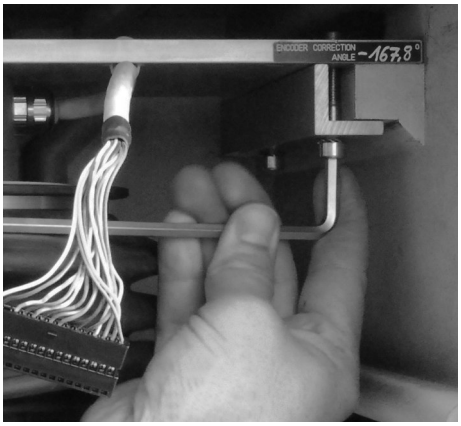
18. Remove the master PCB from the compass housing.

⇒ Be careful not to damage any connectors or cables.



19. Unscrew the front left 5 mm hex-head screw to loosen the left holding clamp of the baseplate.

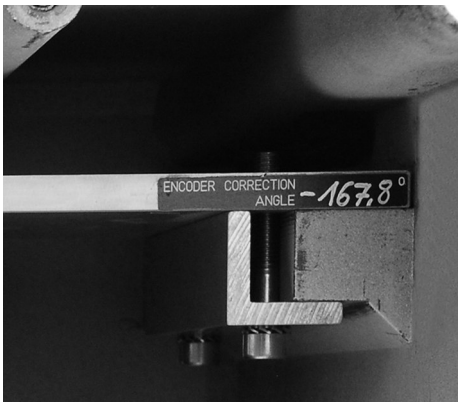
⇒ Do not unscrew the 5 mm hex head screw completely.



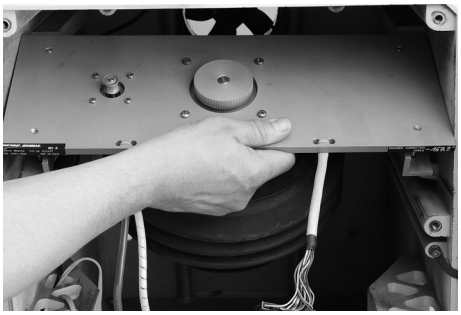
20. Unscrew the front right 5 mm hex-head screw and continue to unscrew the rear left and rear right 5 mm hex-head screws to completely loosen the left and right holding clamps of the baseplate.

⇒ Do not release the 5 mm hex head screws completely.

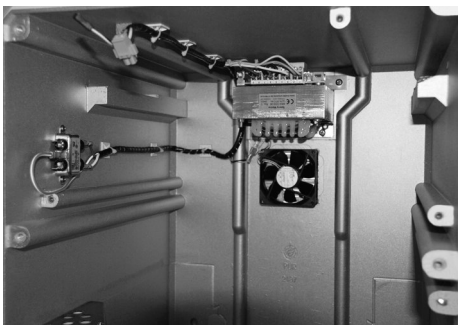
Figure 6-1:
Shaft encoder correction angle value sticker



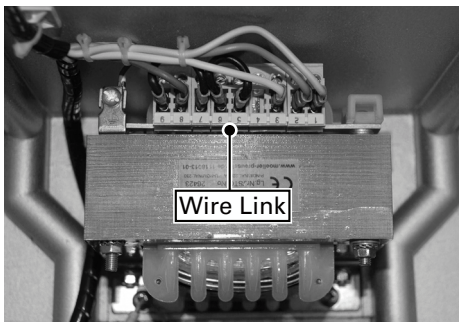
Adjacent picture shows the shaft encoder correction angle value sticker placed at the right front corner of the baseplate.



21. Remove the baseplate with the gyrosphere suspension carefully from the compass housing.

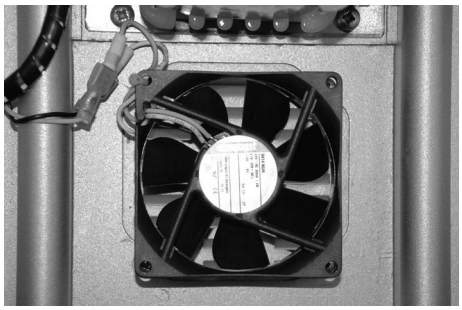


Adjacent picture shows the empty compass housing with the main power supply transformer and cooling fan on the rear side.

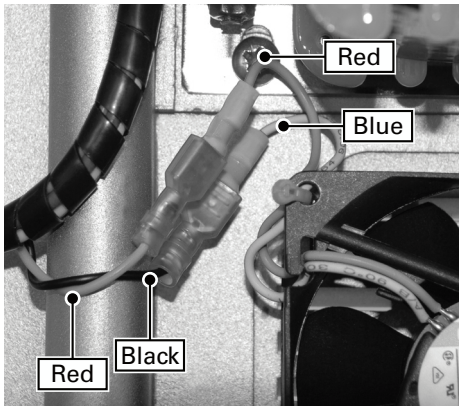


The main power supply transformer with default wire link set for 230 VAC power supply.

⇒ For details of the power supply wire link settings, see Figure 7-1 on page 7-2.



The cooling fan with J2 cable connection.



Details of the cooling fan / J2 cable connection:

– Red / Red
– Blue / Black

6.2 Installing System Components into the Compass Housing

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines, and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Make sure that the main and backup power supplies of the compass are always switched off and safeguarded against accidental switching-on before any removal or installation procedures of the gyrosphere container.

CAUTION

Risk of damage of electrostatic-discharge-sensitive components
The NAVIGAT X MK 1 contains electrostatic sensitive components. Electrostatic discharge may permanently damage components.
When servicing the NAVIGAT X MK 1, take considerable precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

Parts, materials and tools required

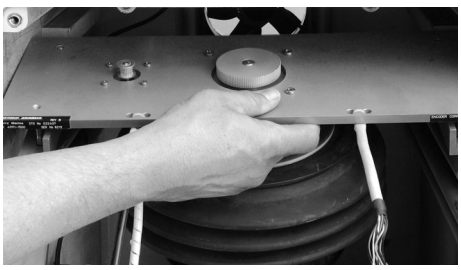
- 5 mm hex key
- 3 mm hex key
- No. 2 Phillips-head screwdriver

Procedure

1. Make sure that the compasses main and backup power supplies are switched off.

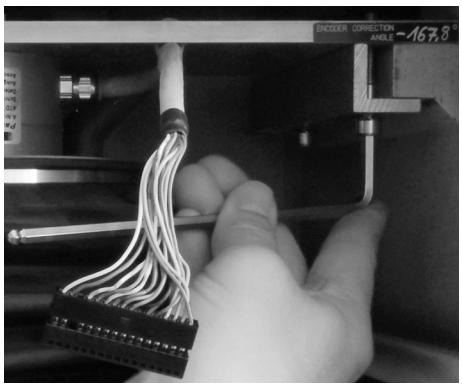
Note

Take all the necessary precautions to make sure that the compasses main and backup power supplies remain switched off during any removal and installation procedures.

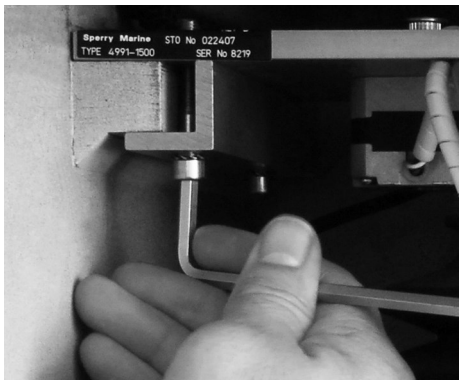


2. Insert the baseplate with the gyrosphere suspension carefully into the compass housing.

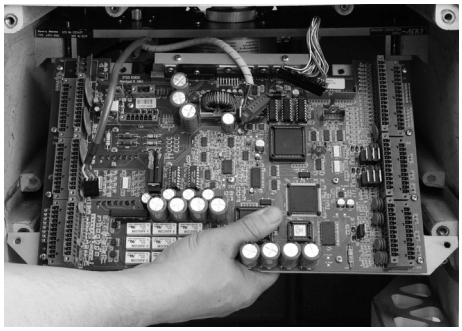
⇒ In case the baseplate does not smoothly slide in, readjust the hex-head screws that the holding clamps have enough clearance.



3. Tighten the front right 5 mm hex-head screw.

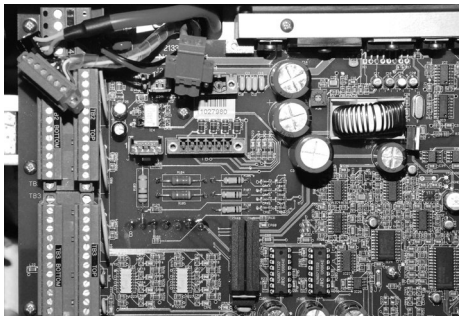


4. Tighten the front left 5 mm hex-head screw and continue to tighten the rear left and rear right 5 mm hex-head screws to completely secure the left and right holding clamps of the baseplate.



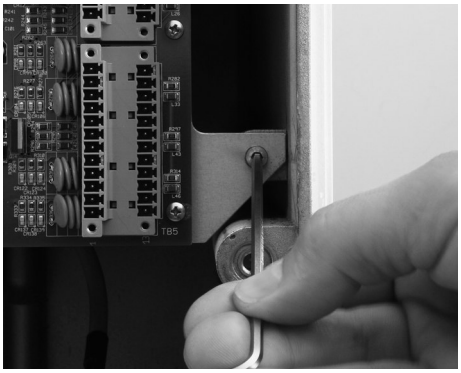
5. Insert the master PCB carefully into the compass housing.

⇒ Place all cables in the cut-outs of the master PCB to not damage any connectors or cables.

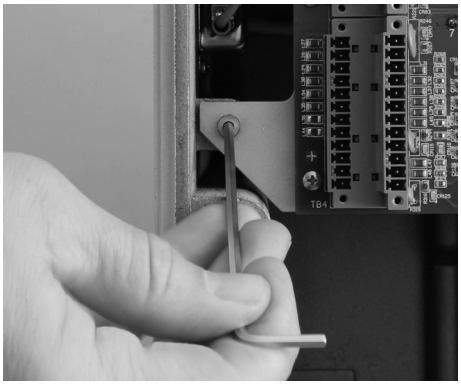


Adjacent picture shows the cables fed through the left cut-out of the master PCB.

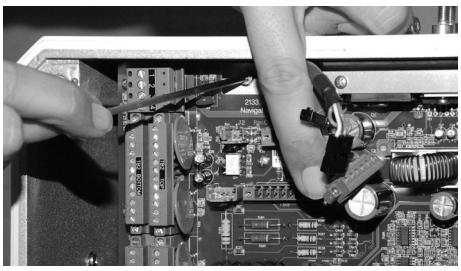
Adjacent picture shows the cables fed through the right cut-out of the master PCB.



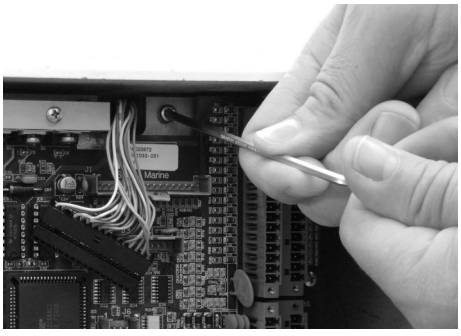
6. Hold the master PCB with one hand to prevent it from falling out.
7. Tighten the lower right 3 mm hex-head screw of the master PCB.



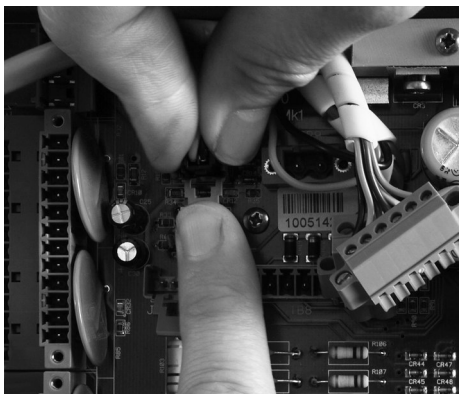
8. Tighten the lower left 3 mm hex-head screw of the master PCB.



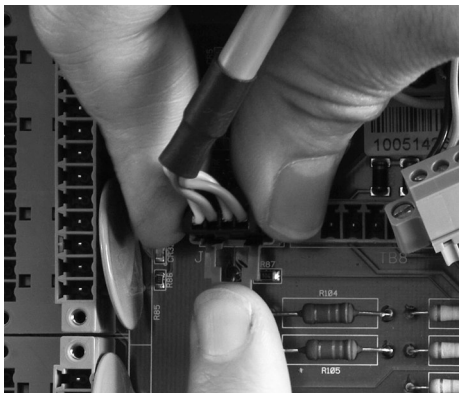
9. Tighten the upper left 3 mm hex-head screw of the master PCB.



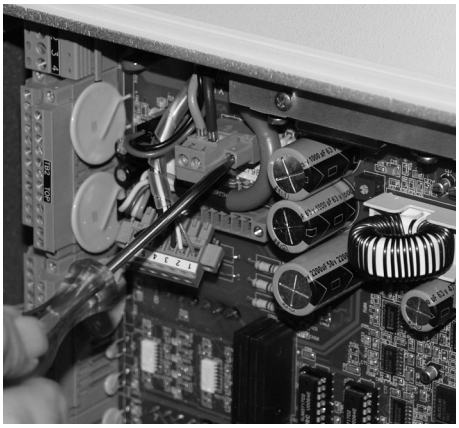
10. Tighten the upper right 3 mm hex-head screw of the master PCB.



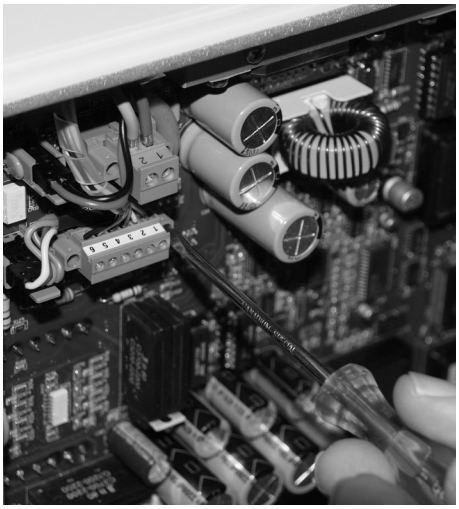
11. Bend the retaining plate of the J2 plug connector away and plug in the J2 connector.



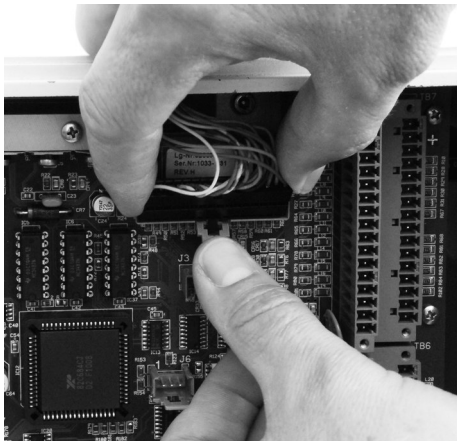
12. Bend the retaining plate of the J4 plug connector away and plug in the J4 connector.



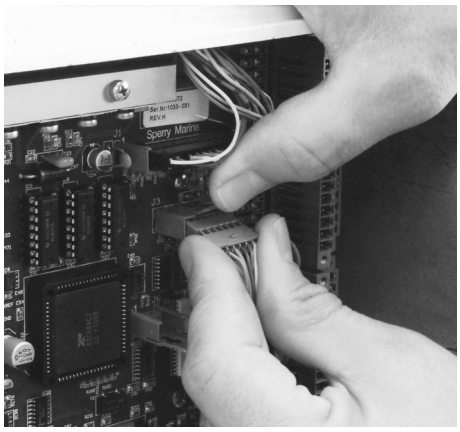
13. Plug in the TB 9 plug connector and tighten the screws of the TB 9 plug connector.



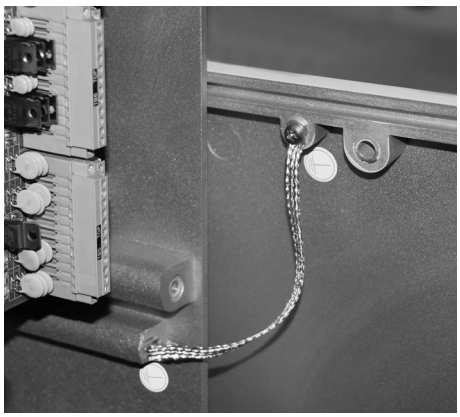
14. Plug in the TB 8 plug connector and tighten the screws of the TB 8 plug connector.



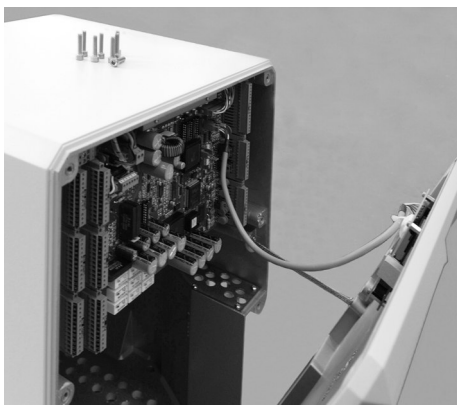
15. Bend the retaining plate of the J1 plug connector away and plug in the J1 connector.



16. Bend the retaining plate of the J3 plug connector away and plug in the J3 connector of the CDU cable.



17. If previously removed, reconnect the grounding strap to the compass housing.



18. Place the door in front of the compass housing and close the door.

19. Tighten the 5 mm hex-head screws of the compass housing door.

20. Continue until all 5 mm hex-head screws are tightened.

Chapter 7: System Installation

7.1 Mechanical Installation

CAUTION

Risk of damage to the gyrosphere
The gyrosphere is always to be transported in its carrying box in the original transport container.
Do not throw or drop the transport container.
The transport container is to be transported in an upright position only.

CAUTION

Risk of damage to the gyrosphere
Carry the carrying box containing the gyrosphere by hand only and handle it with extreme care.
Remove the gyroshpere from the carrying box only if required for immediate installation.

The NAVIGAT X MK 1 gyrocompass system when delivered comprises the NAVIGAT X MK 1 compass housing complete with installed base plate assembly, stock no. 022407, and master PCB, stock no. 020672, the gyrosphere container, stock no. 022561,
the gyrosphere, stock no. 074829,
and the installation and replacement parts kit, stock no. 022638.

The gyrosphere is contained in a specially designed transport box. This transport box is completely suitable for transport purposes by air, sea, rail and road.

Until installation, the gyrosphere is always to be stored in its original transport box. Upon installation, the gyrosphere is to be removed from the transport box and is to be carried by hand directly to the place of installation.

Installing the Compass Housing

The compass housing is to be attached to a level surface, e.g. a floor or console base by means of six M10 bolts or welding studs (to be supplied by the shipyard). At the location of the compass, proper ventilation must be ensured and sufficient space provided for the housing to be opened and maintenance work to be carried out.

For the amount of space required, the attachment points and the position of the cable inlets, refer to dimension drawing 4914-0112-02 in the appendix.

In the horizontal plane, the compass may be installed at any angle with respect to the vessel's longitudinal axis.

Alignment error (i.e. the angle between the compass' and the vessel's longitudinal axis) is corrected electronically by setting the alignment error correction value in the Service Setup 1, see "Configuration Menu - Service Setup 1" on page 8-1 for details.

7.2 Electrical Installation

AC Supply Power Configuration

DANGER

Life danger through electrical shock
When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
Make sure the compass' main and backup power supplies are always switched off and safeguarded against accidental switching-on when configuring the system for the vessel's AC supply voltage,

Note

This Operation, Installation and Service Manual 056343 applies only for NAVIGAT X MK 1 systems with the new type master PCB and the PCB transformer on the rear side.
For NAVIGAT X MK 1 systems with the old type master PCB and the PCB transformer on the front side, only the Operation, Installation and Service Manual 056310 is applicable.

The NAVIGAT X MK 1 main power supply transformer in the compass housing is delivered pre wired for 230 VAC power supply with a wire link connecting the transformer terminals 5 to 6, as shown in Figure 7-1. If the system is required to operate on 115 VAC power supply, wire links must be installed to link the transformer terminals 4 to 6 and 5 to 7.

To gain access to the main power supply transformer, the master PCB and the baseplate must be temporarily removed from the compass housing, see "Removing System Components from the Compass Housing" on page 6-1 for details.

Figure 7-1:
AC supply power configuration terminals

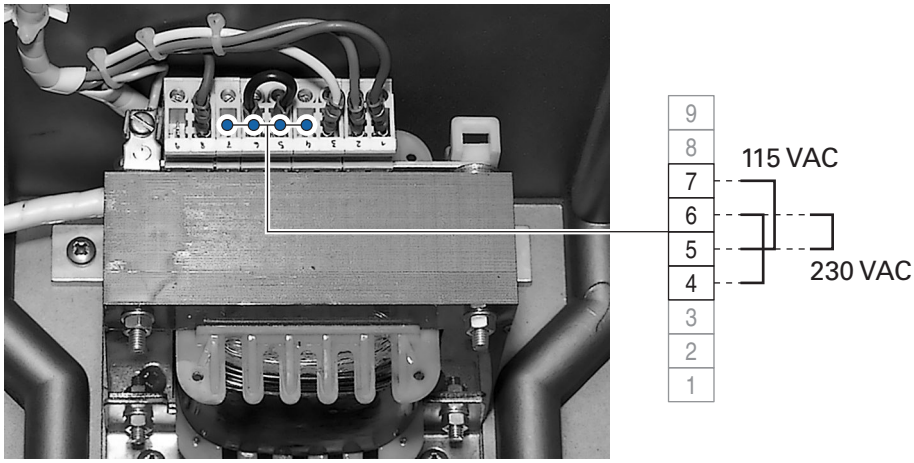


Figure 7-1 shows the default wire link set for the 230 VAC power supply.

Wiring Up the System

DANGER

Life danger through electrical shock
When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
Make sure the compass' main and backup power supplies are always switched off and safeguarded against accidental switching-on when configuring the system for the vessel's AC supply voltage,

CAUTION

Risk of malfunction through wrong wiring
Wrong wiring, especially as running wires from one side of the compass housing to the other or across the master PCB will cause malfunction.
Always use the cable inlets on both sides of the compass housing for accurate wiring and keep all wires running inside the housing as short as possible.
Always avoid to run wires from one side of the compass housing across to the other.

CAUTION

Risk of earth faults
Wrong wiring of the cable shields makes the cables act as antennas resulting in earth faults.
Always make sure to correctly draw back the cable shields and fasten the cables to avoid earth faults.

Note

In case of earth faults, it is recommended to always check first the cable wiring for correctly connected cable shields.

Wire up the system according to the standard connection diagrams and other relevant documents provided in the appendix.
If installation-specific connection diagrams have been provided for a given system, these supersede any connection information contained in standard connection diagrams.

Ship's cables are directly connected to screw-down terminals on the master PCB.

Insert the ship's cables through the inlets at the sides of the compass housing. Remove the outer cable covers, draw back the cable shields and fasten the cables with clamps or tie-wraps to the threaded studs of the inlet plates. Refer to dimension drawing 4914-0112-02 in the appendix.

Route the wires connecting to TB1 – TB4 through the inlets on the left hand side of the housing.
Route the wires connecting to TB5 – TB7 through the inlets on the right hand side.

7.3 Gyrosphere Installation

CAUTION

Risk of damage through unauthorized service
Any service and installation work on the gyrosphere is to be carried out by authorized service personnel only.
Never undertake service or installation work if unskilled for the certain procedure.

When the compass housing has been mounted and the system is wired up so far that supply power is available, procedures should continue with the installation of the gyrosphere into the gyrosphere container and the mounting of the assembled container in the compass.

Alternatively, the installer may wire up the system completely and carry out the initial system configuration before the gyrosphere is installed.

Note

For installation and service procedures of the gyrosphere and gyrosphere container, the following separate Installation, Maintenance and Service Procedures, delivered with the gyrosphere, apply:
- 04911-0125-001, for gyrosphere type 2, gyrosphere container mod. 7/2
- 04911-0125-002, for gyrosphere type 2, gyrosphere container mod. 10/2
- 05000-0125-001, for gyrosphere type 3, gyrosphere container mod. 10/3.

7.4 Initial System Configuration

To make the system fully functional, the configuration parameters need to be set to the required values in the Service Setup 1, see "Configuration Menu - Service Setup 1" on page 8-1.

Additionally, the applicable standard operational settings should be entered in the Manual Settings menu.

If a magnetic compass heading source is connected to the NAVIGAT X MK 1 system, the magnetic compass calibration procedure should be carried out during a sea trial, as described under "Magnetic Compass Calibration" on page 7-8.

Configuration of the System

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Be extremely careful when operating the compass while the housing is open. Do not touch the master PCB, the connecting cables to the gyrosphere container or any other conductive components on the container or in the compass housing.
Always exclude any contact to energized components.

1. Check that the wiring has been carried out completely. All devices connected to data or signal in- and outputs should be operative.
2. Energize the system at the vessel's switch and fuse unit.
   A startup message is displayed and the initial self test is executed.

Note

If the initial system configuration is carried out before the installation of the gyrosphere, the system will raise a „gyro failure" alarm at power-up. The alarm may be safely acknowledged at this point to continue with the initial configuration.

3. Go to the "Configuration Menu - Service Setup 1" on page 8-1.
4. Select the required system type and heading reference selection settings.
5. In dual or triple gyro systems, assign the required compass ID.
6. Select the required data formats for all devices connected to the data inputs. In G or GG type systems, disable the magnetic compass heading input, in G or GM type systems, disable the ext. gyro input.
7. Select the required data output formats and IEC 61162/NMEA protocol standard setting.
8. Check that the min./max. limits for the speed filter are well outside the possible range of the vessel's operating speed. In high-speed craft, the max. speed value will have to be increased.
9. If required, set the parameters for the analogue rate of turn output, the status in- and outputs and the rudder angle feedback inputs.

Note

Do not change the factory-set shaft encoder correction angle in the Service Setup 1.

Note

The alignment error correction may be set to an approximate value at this point.
The existing alignment error, however, must be determined exactly later on and corrected as required.

Finalizing the Installation

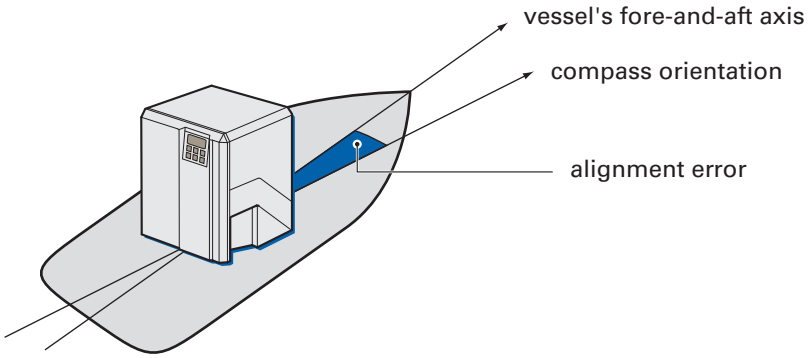
1. Set the operational parameters in the Manual Settings menu to suitable values, see ”Manual Settings Menu” on page 2-10 for details. Wherever possible, automatic data input should be selected in preference of manual input.
2. Enter the current date and time in the User Setup menu, see “User Setup” on page 2-17 for details.
3. After configuration, undertake a function-check of the system with all connected equipment in operation. Use the test mode in the Service Setup 1. See ”TEST MODE” on page 8-14 to check the heading output to serial and 6 step/° repeaters and the analogue rate of turn output. The test mode is functional even if the gyrosphere is not yet installed.
4. If not yet installed, the gyrosphere must now be installed and the proper function of the compass verified.
5. To bring the gyrocompass system into working order, the existing alignment error must now be determined exactly and the error correction applied as described under ”Alignment Error Correction” on page 7-7.
6. If required, determine the correction values for the magnetic compass heading and enter the magnetic compass calibration table as described under ”Magnetic Compass Calibration” on page 7-8.

7.5 Alignment Error Correction

CAUTION

Risk of inaccurate alignment error correction
The compass must have been in continuous operation for at least 4 hours before the alignment error can be determined accurately.
If bearing repeaters are used to determine the true heading, these must be properly aligned to the vessel's fore-and-aft axis.

In order to obtain correct heading data, the existing alignment error (the angular difference between the compass orientation and the vessel's fore-and-aft axis) must be determined and the required correction applied. Alignment error is 0° if the sides of the compass housing run exactly parallel to the vessel's longitudinal axis and the back of the housing points dead ahead. The alignment error correction is carried out electronically by setting the correction value in the Service Setup 1.



To carry out the alignment error correction:

1. Determine the existing alignment error by comparing the compass heading with the vessel's true heading. The true heading must be known to an accuracy of at least 0.5°.
2. Go to the Service Setup 1 and select the align error correction sub-menu, see "Configuration Menu - Service Setup 1" on page 8-1 for details.

3. Enter the required correction value.

⇒ The correction value equals the alignment error with the sign reversed.

Example:
The vessel's true heading is 123.0°,
the compass displays 123.4°,
the alignment error is therefore 0.4°,
thus, the required correction value is - 0.4°.

Note

After accurate correction of the alignment error, the compass is to display the vessel's true heading with an accuracy of at least 0.5°.

7.6 Magnetic Compass Calibration

CAUTION

Risk of inaccurate magnetic compass calibration
The magnetic compass heading calibration corrects deviations due to the combined effects of the magnetic environment, the particular sensor being used and the receiving circuitry on the master PCB.
Therefore, a new calibration must always be carried out when:
- the steering magnetic compass is exchanged or newly adjusted,
- the magnetic compass heading sensor is exchanged and,
- when the master PCB is exchanged, in case a fluxgate sensor is used.
Never use a true heading source, e.g. a gyrocompass, as the calibration reference.
Never attempt to correct residual deviations of a properly adjusted magnetic compass by means of the calibration table.

Ideally, the magnetic compass heading displayed at the NAVIGAT X MK 1 would exactly match the indication of the steering magnetic compass (at a given mag. variation of 0.0°).
In practice, however, deviations will occur between the steering magnetic compass heading and the heading data transmitted by a fluxgate sensor of a magnetic compass or an electronic compass, as displayed at the NAVIGAT X MK 1.

The NAVIGAT X MK 1 automatically corrects such deviations if a calibration table has been stored and calibration is activated in the User Setup.

Note

The Magnetic Compass Calibration Table shall only be switched on for automatic magnetic compass heading correction in case a magnetic compass is indeed connected to the NAVIGAT X MK 1 system via a fluxgate sensor.

Note

If magnetic compass heading is received from an already calibrated source, such as a NAVITWIN, NAVIPILOT or a self-calibrating electronic compass, magnetic compass calibration at the NAVIGAT X MK 1 is not required and must be disabled.

Calibration Procedure Overview

CAUTION

Risk of inaccurate magnetic compass calibration
The magnetic compass used as the calibration reference must be properly installed and adjusted.
The procedure should be carried out in calm seas only.

The magnetic compass calibration is a two-step procedure.

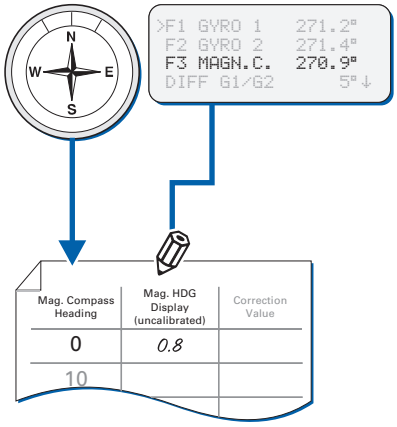
At first, the existing deviations between the indication of the steering magnetic compass and the magnetic compass heading displayed at the NAVIGAT X MK 1 must be determined. This requires that the vessel is swung very slowly through a full circle so that for each 10° of magnetic compass heading (0, 10, ..., 350°) the corresponding display value is obtained.

Then, the resultant correction values are calculated and entered into the magnetic compass heading calibration table at the NAVIGAT X MK 1 see

"MAG. C. CAL. TABLE (magnetic compass calibration table)" on page 2-18 for details.
The magnetic compass heading calibration table stores up to 50 entries ('cal. no.s'), each entry assigns a correction value to a given magnetic compass heading (0, 10, ..., 350°).

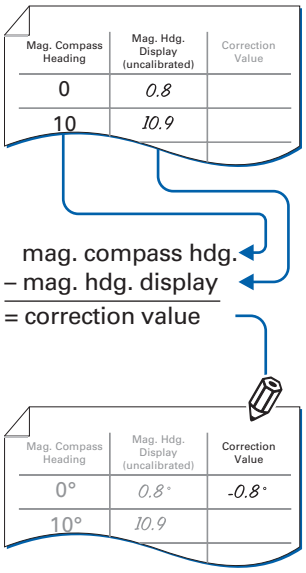
Determining magnetic compass heading correction values

1. Make sure that the magnetic variation is set to 0.0° in "Manual Settings Menu" on page 2-10.
2. Make sure that the calibration is disabled (setting 'OFF' selected in the User Setup / Magn. Cal. Tab. see "MAG. C. CAL. TABLE (magnetic compass calibration table)" on page 2-18 for details.
3. Select a manual steering mode.
4. Commence a continuous, very slow and steady turn. The vessel must be swung through one full circle (360°) at least.



5. While the vessel is turning, compare the indication at the steering magnetic compass with the magnetic compass heading values shown on the NAVIGAT X MK 1 display.

   At every full 10° of steering magnetic compass heading (0°, 10°, ..., 350°), note all the displayed values.
6. Enter the observed display values in the magnetic compass heading calibration table (blank form included in the appendix of this manual).



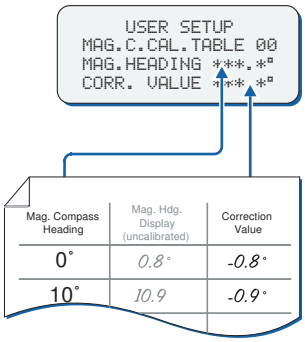
7. Calculate the required correction value for each heading value.

⇒ The correction value is the offset which must be applied to a given display value in order to obtain the steering magnetic compass heading.

Example:
steering magnetic compass heading = 0°,
display value = 0,8°,
correction value = - 0,8°.

Storing the magnetic compass heading calibration table

1. Call up the User Setup and go to the 'Magn Cal Tab' sub-menu.
   Press **Shift-F1**. ('enter values')
   The calibration table entry sub-menu is shown.
2. To enter the previously determined correction values:



a) Using the **Up/Down** and **Dim+/Dim-** keys, enter the respective heading value.

b) Press **Shift-ENTER** to confirm the value.

c) Using the **Up/Down** and **Dim+/Dim-** keys, enter the corresponding correction value.

d) Press **Shift-ENTER** to confirm the value.

3. To enter another pair of values, press **Shift-F2**.
   The table index count in the first line is increased by 1.
   Repeat the procedure from step 2.a) above until all correction values have been entered.
4. Press **MENU** to quit the table entry sub-menu.

To scroll through the list of entries, press **Shift-F2**.or **Shift-F3** respectively from within the table entry sub-menu

To delete a pair of values, if required, go to the calibration table entry sub-menu and twice press **Shift-RESET** followed by **Shift-ENTER** to clear the heading and correction value entries.

Note

The calibration table is stored in the system's permanent memory.
If the complete set of table entries is to be altered (e.g. when a new magnetic compass heading sensor has been fitted or the steering magnetic compass has been newly adjusted), the old entries from the calibration table need to become deleted first.

7.7 Installation Check Procedures

To finish the installation of the NAVIGAT X MK 1 gyrocompass system, it is mandatory to check all installation and system configuration conditions with the following installation check procedures.

Note

Use also the NAVIGAT X MK 1 Installation Checklist Record Sheet 04914-0125-10 in the appendix of this manual.

Mechanical Installation Check Procedure

1. Check if the NAVIGAT X MK 1 gyrocompass housing is correctly mounted on a stable, level surface.
2. Check if all recommended install distances are kept and sufficient space is provided around the housing to open the door and enable service work to be carried out.
3. Check for adequate ventilation at place of installation of the NAVIGAT X MK 1 gyrocompass.
4. Control and note the exact alignment error of the install position for a possible adjustment of the alignment error correction in the Service Setup 1 later on.

⇒ In case a step of the check procedure is not met as required, mend the relevant mechanical installation condition to meet the requirements.

⇒ If all steps of the mechanical check procedure are met as required, proceed with the "Electrical Installation Check Procedure"

Electrical Installation Check Procedure

1. Check if the NAVIGAT X MK 1 is correctly configured for the power supply present (230 VAC / 115 VAC).
2. Check if all wiring of the NAVIGAT X MK 1 gyrocompass system components is performed according to the standard or project specific connection drawings.
3. Check that all wiring cables are fitted with the applicable cable screens and that all cable screens are correctly connected.
4. Check if all wiring cables are correctly connected to the screw-down terminals of the Master PCB.
5. Check if all the ship's cable are correctly inserted through the inlets of the compass housing (wires connecting to TB1 – TB4 through left hand side inlets, wires connecting to TB5 – TB7 through right hand side inlets).
6. Make sure that all wires running inside the housing are short as possible and no wires run from one side across to the other.

7. Check if all NAVIGAT X MK 1 gyrocompass system components are correctly grounded according to the standard or project specific connection drawings.
8. Check if the inner cable screens are connected to system ground of interfacing equipment.
9. Check if a 24 V backup supply voltage floating relative to the ship's ground is installed to the NAVIGAT X MK 1 gyrocompass.

⇒ In case a step of the check procedure is not met as required, mend the relevant installation condition to meet the requirements.

⇒ If all steps of the electrical installation check procedure are met as required, proceed with the "System Configuration Check Procedure".

System Configuration Check Procedure

1. Energize the system and wait until the startup message is displayed and the initial self test is successfully executed.
2. Go to the Service Setup 1, "Configuration Menu - Service Setup 1" on page 8-1.
3. Check if the system type and heading reference selection settings are set to the required values of the gyrocompass system installed.
4. Check if the data formats for all devices connected to the data inputs are set as required:

   In G or GG type systems, check whether, the magnetic compass heading input is disabled.
   In G or GM type systems, check whether the external gyro input is disabled.
5. Check if all the data output formats and IEC 61162/NMEA protocol standard settings are set as required.
6. Control again if the min./max. limits for the speed filter are well outside the possible range of the vessel's operating speed. In high-speed craft, the max. speed value will have to be increased.
7. Check whether the parameters for the analogue rate of turn output, the status in- and outputs and the rudder angle feedback inputs are set, if required.
8. Check if the operational parameters in the Manual Settings menu are set to suitable values, see "Manual Settings Menu" on page 2-10 for details.

   Wherever possible, automatic data input should be selected in preference of manual input.
9. Check if the current date and time are correctly entered in the User Setup menu, see "User Setup" on page 2-17 for details.
10. Control if the gyrocompass system with all connected equipment is fully functional in operation.

    Use the test mode in the "Configuration Menu - Service Setup 1" to check the heading output to serial and 6 step/° repeaters and the analogue rate of turn output.

11. Check the alignment error correction applied as described under "Alignment Error Correction" on page 7-7 and double check with the exactly determined alignment error of the install position.
12. Check whether the correction values for the magnetic compass heading are correctly determined and entered into the magnetic compass calibration table as described under "Magnetic Compass Calibration" on page 7-8, if required.

⇒ In case a step of the check procedure is not met as required, mend the relevant installation condition to meet the requirements.

⇒ If all steps of the system configuration check procedure are met as required, the NAVIGAT X MK 1 gyrocompass installation has been successfully installed and tested.

Chapter 8: System Configuration

8.1 Configuration Menu - Service Setup 1

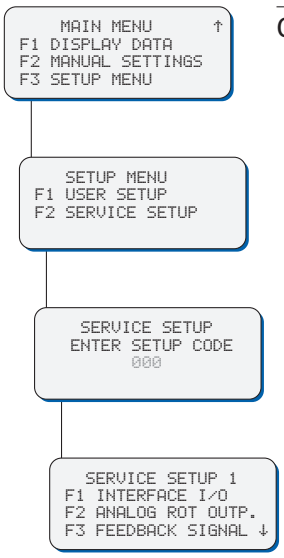
The Service Setup 1 provides access to the system parameters which configure the NAVIGAT X MK 1 according to the requirements of the installation at hand.

The Service Setup 1 also provides a test mode to check the proper function of the serial and 6 step/° heading outputs and the analogue rate of turn output.

Setup Access Code

To prevent inadvertent or unauthorized changes to the system configuration, setup menus which are to be accessed by service personnel only are protected by access codes.

To access the Service Setup 1:



Call up the Main Menu

Press **Shift-F2** to select "Service Setup".

When prompted for the setup code:
Enter code "**600** "
Press **Shift-ENTER** to confirm the code.

The Service Setup 1 sub-menu opens.

Service-Setup 1 – Overview

Figure 8-1:
Service Setup 1

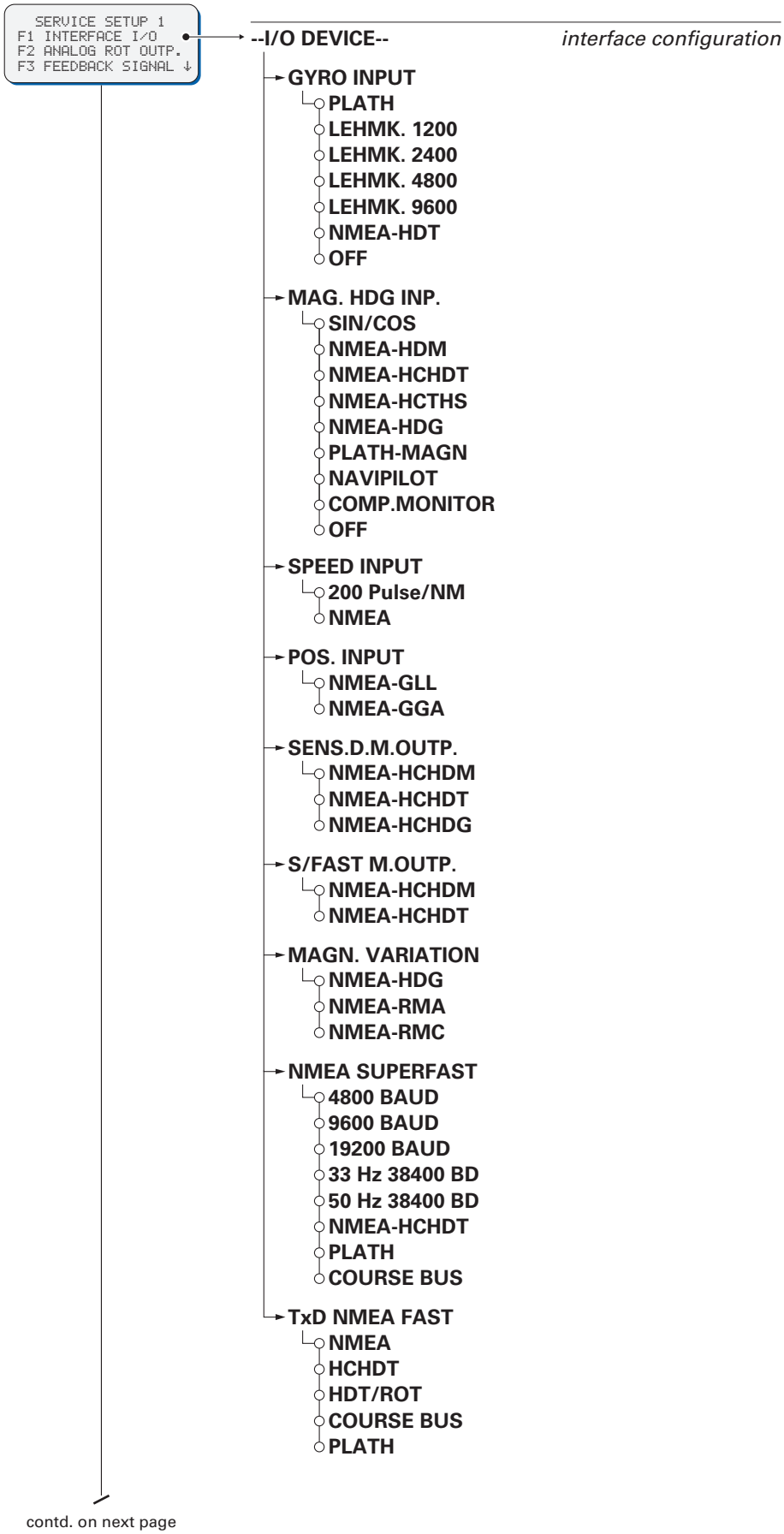


Figure 8-2: Service Setup 1 (contd.)

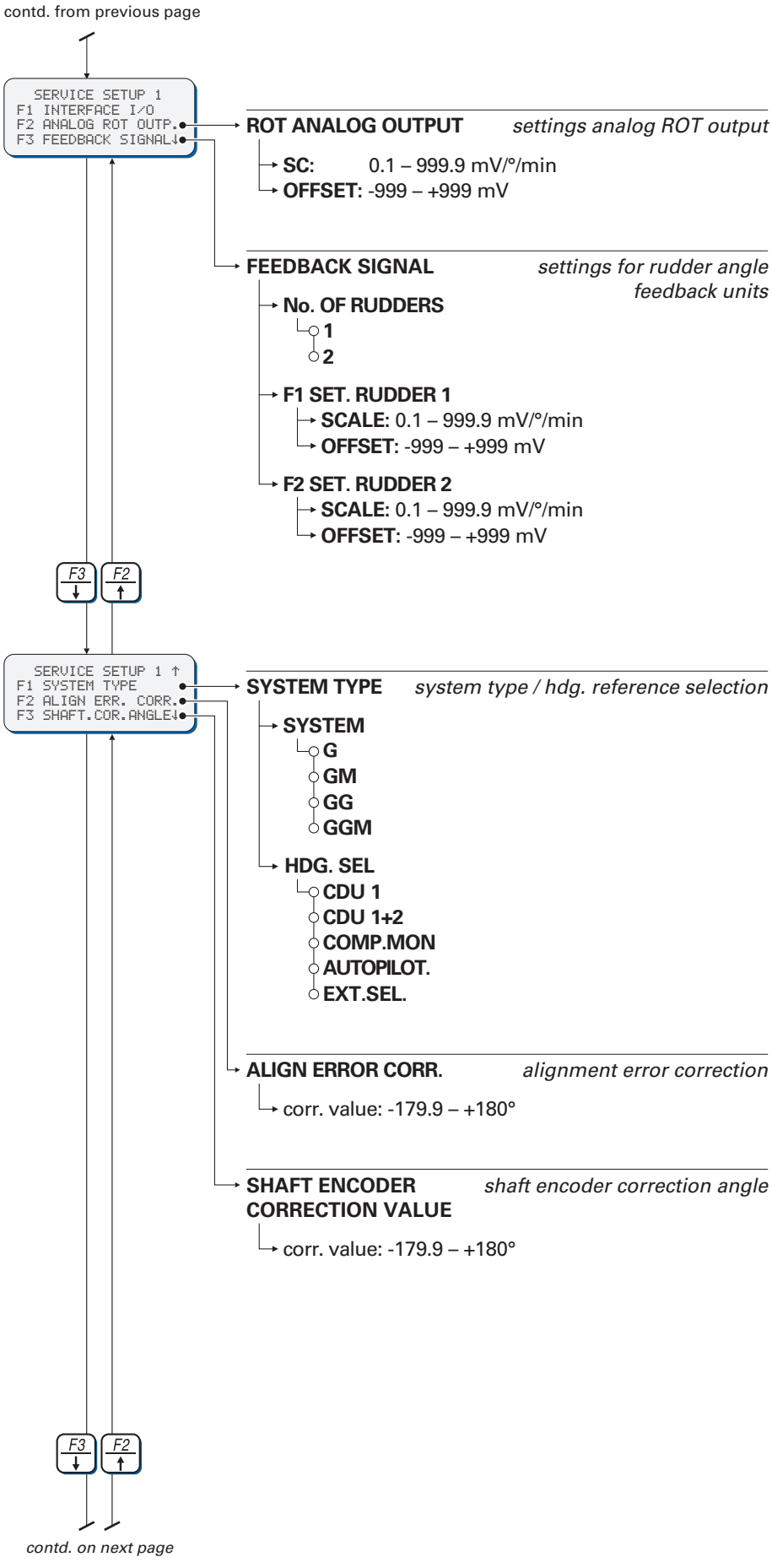


Figure 8-3: Service Setup 1 (contd.)

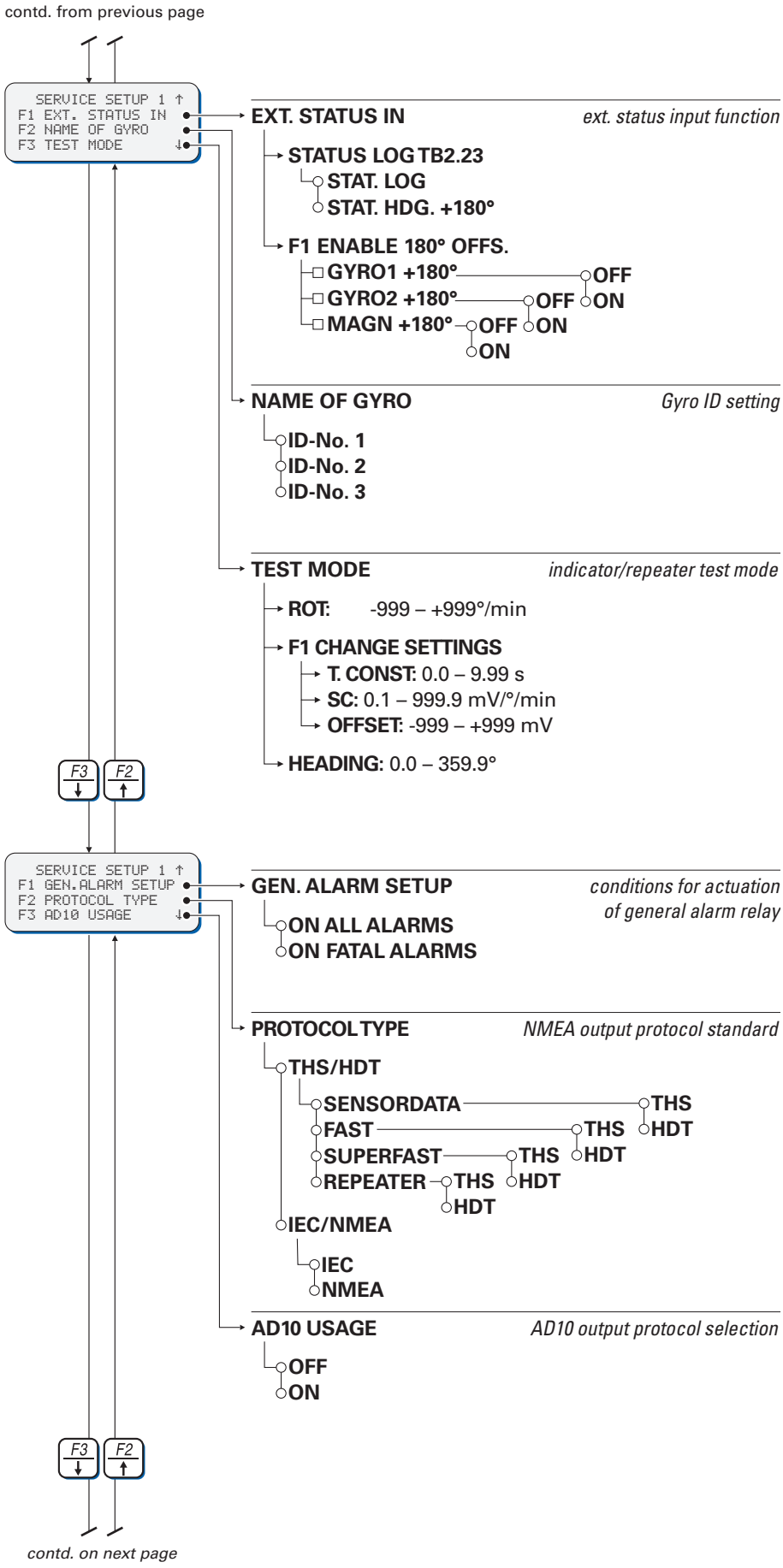
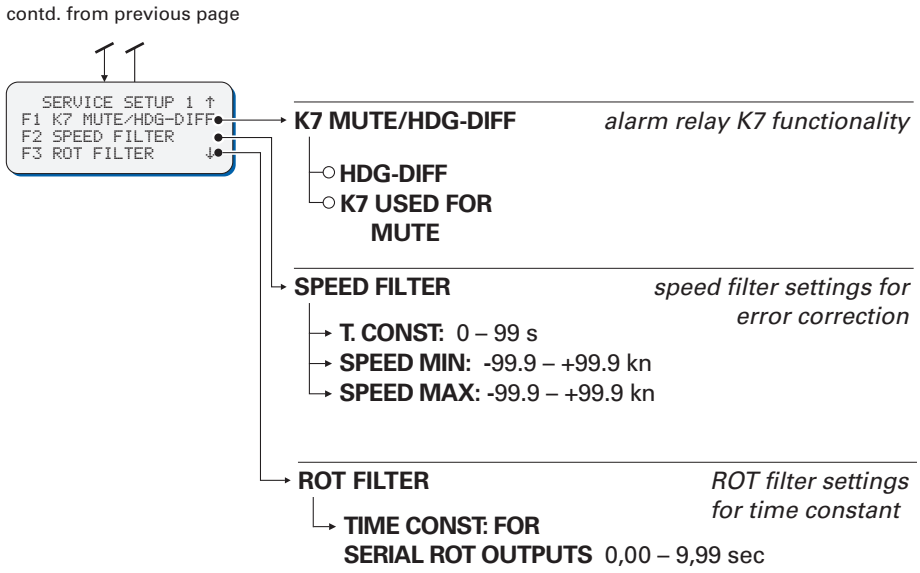


Figure 8-4:
Service Setup 1
(contd.)


contd. from previous page
SERVICE SETUP 1 ↑
F1 K7 MUTE/HDG-DIFF
F2 SPEED FILTER
F3 ROT FILTER ↓
K7 MUTE/HDG-DIFF
alarm relay K7 functionality
HDG-DIFF
K7 USED FOR MUTE
SPEED FILTER
speed filter settings for error correction
T. CONST: 0 – 99 s
SPEED MIN: -99.9 – +99.9 kn
SPEED MAX: -99.9 – +99.9 kn
ROT FILTER
ROT filter settings for time constant
TIME CONST: FOR SERIAL ROT OUTPUTS 0,00 – 9,99 sec

Service Setup 1 – Parameters

I/O DEVICE (interface inputs, outputs)

Configures the in- and output interfaces.

GYRO INPUT
Selects the interface protocol for the ext. Gyro input.

Settings:

PLATH
The input reads the PLATH binary data protocol

LEHMK. 1200
The input is reads the Lehmkuhl (Scandinavian Microsystems) protocol at 1200 Bd.

LEHMK. 2400
The input is reads the Lehmkuhl (Scandinavian Microsystems) protocol at 2400 Bd.

LEHMK. 4800
The input is reads the Lehmkuhl (Scandinavian Microsystems) protocol at 4800 Bd.

LEHMK. 9600
The input is reads the Lehmkuhl (Scandinavian Microsystems) protocol at 9600 Bd.

NMEA-HDT
The input reads the NMEA $--HDT sentence

OFF
The input is disabled

MAG. HDG INP. (magnetic heading input
Configures the magnetic compass heading input.

Settings: **SIN COS**
The input reads analogue voltages from a Sperry Marine fluxgate sensor type 4863 at the analogue fluxgate interface

NMEA-HDM
The input reads the NMEA $--HDM sentence at the NMEA magnetic interface

NMEA-HCHDT
The input reads the NMEA $--HCHDT sentence at the NMEA magnetic interface

NMEA-HCTHS
The input reads the NMEA $--HCTHS sentence at the NMEA magnetic interface

NMEA-HDG
The input reads the NMEA $--HDG sentence at the NMEA magnetic interface

PLATH-MAGN
The input reads magnetic compass heading from the PLATH binary data protocol at the NMEA magnetic. interface

NAVIPILOT
The input reads magnetic compass heading from the NAVI-PILOT repeater protocol at the NMEA magnetic. interface

COMP. MONITOR
The input reads magnetic compass heading (NMEA) at the Compass Monitor interface

OFF
The input is disabled

SPEED INPUT
Configures the speed input.

Settings: **200 Pulse/NM**
Speed is computed from pulses at the 200 p./NM interface

NMEA
The input reads speed from an NMEA sentence received at the serial speed data input 1.

POS INPUT (position input)
Configures the position input.

Settings: **NMEA-GLL**
The input reads the NMEA $--GLL sentence

NMEA-GGA
The input reads the NMEA $--GGA sentence

SENS.D.M.OUTP. (sensor data magnetic output)
Selects the output sentence format for the magnetic compass heading at the sensor data outputs

Settings: **NMEA-HCHDM**
Magnetic compass heading is sent using the NMEA $--HDM sentence with talker ID “HC”

NMEA-HCHDT
Magnetic compass heading is sent using the NMEA $--HDT sentence with talker ID “HC”

NMEA-HCHDG
Magnetic compass heading is sent using the NMEA $--HDG sentence with talker ID “HC”

S/FAST M. OUTP. (superfast and fast magnetic output).
Selects the output sentence format for the magnetic compass heading at the FAST and SuperFAST data outputs

Settings: **NMEA-HCHDM**
Magnetic compass heading is sent using the NMEA $--HDM sentence with talker ID “HC”

NMEA-HCHDT
Magnetic compass heading is sent using the NMEA $--HDT sentence with talker ID “HC”

MAGN. VARIATION (magnetic variation)
Selects the sentence format for the automatic magnetic variation input

Settings: **NMEA-HDG**
Magnetic variation is read from the NMEA $--HDG sentence at the serial data magnetic interface

NMEA-RMA
Magnetic variation is read from the NMEA $--RMA sentence at the currently active position interface

NMEA-RMC
Magnetic variation is read from the NMEA $--RMC sentence at the currently active position interface

NMEA SUPERFAST
Configures the SuperFAST serial data output.

Settings: **4800 Baud**
The output transmits all available data in NMEA format at 4800 Bd. (standard according to IEC 61162-1)

9600 Baud
The output transmits all available data in NMEA format at 9600 Bd. (none-standard)

19200 Baud
The output transmits all available data in NMEA format at 19200 Bd. (none-standard)

33 Hz 38400 Bd
The output transmits all available data in NMEA format at 38400 Bd. (high-speed according to IEC 61162-2)
The update rate for the HDT sentence is 33 Hz.

50 Hz 38400 Bd
The output transmits all available data in NMEA format at 38400 Bd. (high-speed according to IEC 61162-2)
The update rate for the HDT sentence is 50 Hz.

NMEA-HCHDT
The output transmits magnetic compass heading only, using the NMEA $HCHDT sentence at 4800 Bd.

PLATH
The output transmits heading and rate of turn data, using the PLATH binary protocol at 9600 Bd.

COURSE BUS
The output transmits heading data, using the serial Course Bus protocol at 9600 Bd.

TxD NMEA FAST
Configures the FAST serial data output.

Settings: **NMEA**
The output transmits all available data in NMEA format at 4800 Bd. (standard according to NMEA / IEC 61162-1)

HCHDT
The output transmits magnetic compass heading only, using the NMEA $HCHDT sentence at 4800 Bd.

HDT/ROT
The output transmits the active heading and rate of turn data only, using the NMEA $--HDT and $--ROT sentences at 4800 Bd.

COURSE BUS
The output transmits heading data, using the serial Course Bus protocol at 9600 Bd.

PLATH
The output transmits heading and rate of turn data, using the PLATH binary protocol at 9600 Bd.

ROT ANALOG OUTPUT

Configures the analogue rate of turn output (ROT).

SC. (scaling)
Sets the scaling factor value for the analogue ROT output.

Value: **0.1 – 999.9 mV/°/min.**

OFFSET
Sets the zero-point offset value for the analogue ROT output.

Value: **- 999 – + 999 mV**

FEEDBACK SIGNAL

Configures the rudder angle feedback inputs.

No. OF RUDDERS
Selects between single and dual rudder systems.

Settings: **1**
Single rudder system; rudder angle input 1 is used only

2
Dual rudder system; both rudder angle inputs are used; separate graphs are printed for port and stb. rudder angles

SET RUDDER 1
Sets the scaling factor and zero-point offset value for the rudder angle input 1.

Settings: SCALE (scaling factor): **0.1 – 999 mV/°/min.**
OFFSET (zero-point offset value): **- 9.9 – + 9.9°**

SET RUDDER 2
Sets the scaling factor and zero-point offset value for the rudder angle input 2.

Settings: SCALE (scaling factor): **0.1 – 999 mV/°/min.**
OFFSET (zero-point offset value): **- 9.9 – + 9.9°**

SYSTEM TYPE

Configures the system type and the heading selector device.

SYSTEM
Sets the system configuration

Settings: **G**
Single gyrocompass system: the control and display unit shows own gyro heading only; the heading source selection and heading difference alarm functions are not available.

GM
Gyro-/Magnetic compass system: the control and display unit shows own gyro and magnetic compass headings; heading source selection and heading difference monitoring functions are available for sources G and M.

GG
Dual gyrocompass system: the control and display unit shows both gyrocompass headings; heading source selection and heading difference monitoring functions are available for sources G1 and G2.

GGM
Dual gyrocompass/Magnetic compass system: the control and display unit shows both gyro and magnetic compass headings; heading source selection and heading difference monitoring functions are available for sources G1, G2 and M.

HDG. SEL (heading selection)
Selects the heading source selector device to use.

Settings: **CDU 1**
Standalone system: the active heading source is selected at the control and display unit

CDU 1+2
Dual gyrocompass system: the active heading source is selected at either one of the gyrocompasses' control and display units

COMP.MON (compass monitor)
Multi compass system with Compass Monitor/Heading Management system NAVITWIN: the active heading source is selected at the NAVITWIN

AUTOPILOT
Gyrocompass/Autopilot system: the active heading source is selected at the autopilot (NAVIPILOT V, ADII or V HSC)

EXT. SEL. (external selector)
The active heading source is selected using an external selector switch

ALIGN ERROR CORR. (aligment error correction)

Sets the value for the alignment error correction

Settings: **- 179.9 – + 180.0 °**

Shaft Encoder Correction Value

Sets the value for the shaft encoder correction angle

Settings: **- 179.9 – + 180.0 °**

EXT. STATUS IN (external status input)

Configures the external status signal input port

STATUS LOG TB2.23
Selects the function of the port

Settings: **STAT LOG (status log)**
The port is used to monitor the "alive" status from a pulse speed log; if the active log is a pulse log and the input contact is open, a speed log failure alarm is given.

STAT HDG. + 180° (status heading + 180°)
The port is used to reverse the heading displays and data outputs (e.g. for use in double-ended ferries); when the input contact is closed, an offset of 180° is applied to the heading of the sources of which the offset function is enabled.

ENABLE 180° OFFS. (enable 180° offset)
Enables/disables the 180° offset function for the respective heading source.

Settings: **Gyro1 + 180° (ON/OFF)**
Gyro2 + 180° (ON/OFF)
MAGN + 180° (ON/OFF)
"**ON**" enables, "**OFF**" disables offset function for respective heading source

NAME OF GYRO

Sets the ID of the gyrocompass.

Settings: **1**
Standalone single gyro or main gyro in multiple gyrocompass system.

2
Backup gyro in a dual or triple gyrocompass system.

3
Backup gyro in a triple gyrocompass system.

TEST MODE

Activates the test mode for the ROT and heading outputs

ROT
Sets the rate of turn value and turn direction for the test mode

Settings: **- 999 – + 999 °/min**

CHANGE SETTINGS
Accesses the analogue ROT output settings

T. CONST (time constant): **0.0 – 9.9 s**
SC (scaling factor): **0.1 – 999.9 mV/°/min**
OFFSET (zero offset): **- 999 – + 999 °/min**

Note

The „Change Settings“ sub-menu provides quick access to the different analogue ROT output setting sub menus. Changes made during the test mode directly affect:
- the ROT damping time constant value for the Manual Settings / analogue rate of turn output menu, and the
- scale factor and zero offset values in the Service Setup 1 / Analog ROT Outp. menu respectively.

HEADING
Sets the target heading value for the test mode

Settings: **- 0.0 – + 359.9 °**

GEN. ALARM SETUP (general alarm setup)

Selects in which cases the “General Alarm” relay is actuated.

Settings: **ON ALL ALARMS**
The relay is actuated whenever an alarm condition exists.

ON FATAL ALARMS
The relay is actuated only in case of fatal alarms. A fatal alarm exists when the gyrocompass can no longer provide its own heading data. Loss of external data and the heading difference alarm are none-fatal alarm conditions.

PROTOCOL TYPE

Selects the conformance level for the NMEA outputs

Settings: **THS/HDT**

THS: Actual vessel heading in degrees true produced by any device or system producing true heading. This sentence includes a “mode indicator” field providing critical safety related information about the heading data, and replaces the deprecated HDT sentence.

HDT: Actual vessel heading in degrees true produced by any device or system producing true heading.
(HDT is a deprecated sentence which has been replaced by THS).

REPEATER	**THS**
	HDT
SENSOR DATA	**THS**
	HDT
FAST	**THS**
	HDT
SUPER-FAST	**THS**
	HDT

IEC/NMEA **IEC**
NMEA outputs conform strictly to IEC 61162-1. Proprietary output sentences start with $PPLA...

IEC is the mandatory protocol type for all ships.

NMEA
NMEA outputs use the older form of the proprietary nav. status data sentence, $PPNSD.

The NMEA 0183 protocol type is deprecated and shoud only be selected for special purposes.

AD10 USAGE

Enables or disables the AD10 heading data output
When AD10 output is enabled, a total of one SuperFAST and three Sensor Data outputs are available at TB7.

When AD10 output is disabled, a total of two SuperFAST and four Sensor Data outputs are available at TB7.

Settings: **ON**
Enables AD10 output.
Terminals TB 7.11/7.12 provide the AD10 data signal, terminals TB 7.13/7.14 provide the AD10 clock signal.

OFF
Disables AD10 output.
Terminals TB 7.11/7.12 provide a SuperFAST RS-422 output, terminals TB 7.13/7.14 provide a Sensor Data RS-422 output.

K7 MUTE/HDG-DIFF (K7 mute / heading difference)

Configures the heading difference alarm function of the alarm relay K7 output

Settings: **HDG-DIFF**
Relay K7 is used to signal the heading difference alarm condition. This option must be selected in multi compass systems which route the individual compasses' hdg-diff alarm relay outputs to a central alarm facility.

K7 USED FOR MUTE
Relay K7 is used to mute an audible alarm generated by a central alarm facility. When this option is selected, relay K7 is actuated whenever an alarm is acknowledged or muted locally at the NAVIGAT X MK 1.
In multi compass systems which also require a heading difference alarm output, a separate compass monitoring device, such as the NAVITWIN IV, must provide the heading difference alarm.

SPEED FILTER

Sets the filter parameters used for the North speed error correction. The preset factory defaults should not normally be altered. In high-speed craft, however, it will be necessary to increase the maximum speed value to prevent rejection of valid high speed values.

Settings: **T. CONST. (time constant)**
filter time constant: 0 – 99 s (default = 20 s)

The filter time constant determines the level of filtering applied to the incoming speed before it enters the calculation of North speed error correction.
Occasional dropouts and glitches will be completely blocked for a duration of up to the time constant's value. At the same time, the effects of steady acceleration or deceleration are smoothed out. After a change of speed, a new constant speed will enter the error correction routine with a delay of approximately five times the time constant.

SPEED MIN. (speed minimum)
minimum speed value: - 99.9 – + 99.9 kn (default = - 5.0 kn)

The minimum speed value determines the lower limit of the valid speed range. Actual speeds below the limit will be rejected. Should the actual speed remain below the limit for more than 10 s, a "speed invalid" alarm will be given.

Note

In case a „Speed Invalid" alarm is triggered while the vessel is not in motion or moving very slowly (e.g. when manoevering in harbour), this is often caused by fast currents of fairway water increasing the - 5.0 kn minimum speed default value.
In this case, the minimum speed value must be adjusted accordingly.

Settings: **SPEED MAX (speed maximum)**
(contd.) maximum speed value: - 99.9 – + 99.9 kn (default = 30.0 kn)

The maximum speed value determines the upper limit of the valid speed range. Actual speeds above the limit will be rejected. Should the actual speed remain above the limit for more than 10 s, a “speed invalid” alarm will be given.

ROT FILTER

The ROT filter sets a time constant for the serial ROT outputs.

Settings: **TIME CONST: FOR SERIAL ROT OUTPUTS**
time constant: 0,00 – 9,99 s (no default value)

The time constant for serial ROT outputs can be selected between 0,00 and 9,99 sec.

Typical values for the ROT filter time constant are generally between 2 to 4 sec.

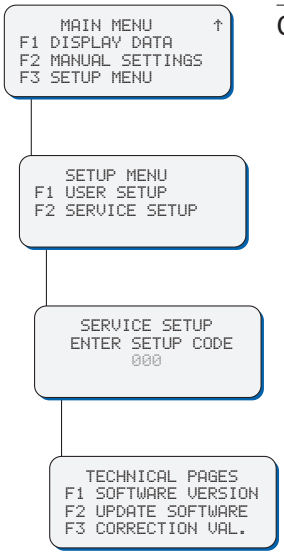
8.2 Factory Settings Menu (Technical Pages)

The Technical Pages provide access to a number of factory-set parameters which need not normally be altered. However, should the system software need to be exchanged, these settings will be lost and must be re-entered manually.

Setup Access Code

To prevent inadvertent or unauthorized changes to the system configuration, setup menus which are to be accessed by service personnel only are protected by access codes.

To access the Technical Pages:



Call up the Main Menu
Press **Shift-F3** to select "Setup Menu"

Press **Shift-F2** to select "Service Setup"

When prompted for the setup code:
Enter code "**140** "
Press **Shift-ENTER** to confirm the code

The Technical Pages sub-menu opens.

Technical Pages – Overview

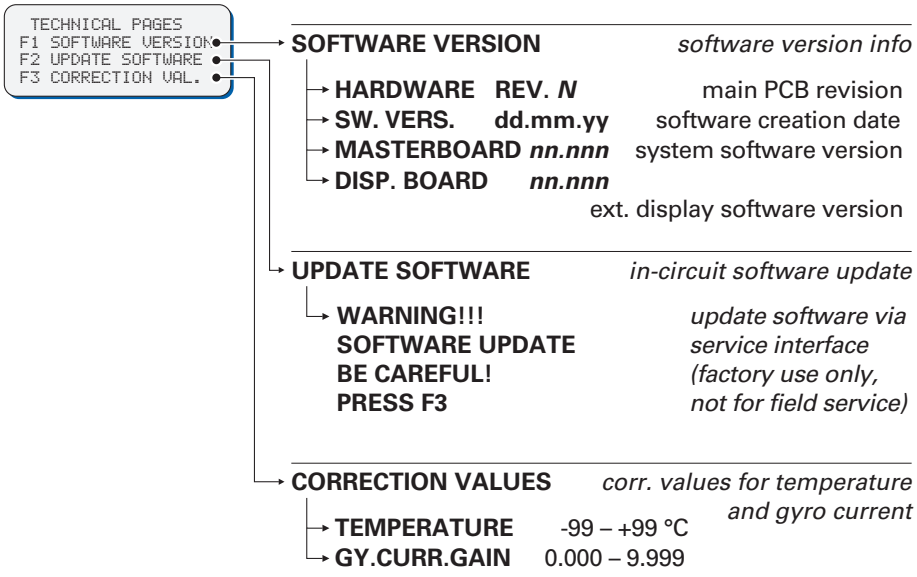


Figure 8-5:
Technical Pages

Technical Pages – Parameters

SOFTWARE VERSION

Displays detailed hard- and software version information.

Settings: **HARDWARE**
The revision code of the master PCB.

SW. VERS. (software version)
The creation date of the system software.

MASTERBOARD
The version code of the system software.

DISP. BOARD (display board)
The version code of an external Control and Display unit, if present. If no external unit is connected, dashes are shown.

UPDATE SOFTWARE

Initiates a software update via the service interface.

Settings: This feature is for factory use only.

„Warning“ and **„F3“** are flashing in the sub-menu. although the F3 key is inactive.

Field service is required to exchange the software flash-memory IC to update the system software.

CORRECTION VALUES

Sets the correction values for the on-board temperature and gyrosphere current measurement.

Settings: **TEMPERATURE**
Temperature correction value. Adjusts the measured value to show the actual temperature inside the compass housing. Correction range is - 99.9 – + 99.9° C.

GY. CURR. GAIN (gyrosphere current gain)
Gain factor for the gyrosphere current. Adjusts the measured value to show the actual current flowing through the gyrosphere.
Correction range is 0.000 – 9.999, where a setting of 1.000 equals unity gain, i.e. no correction.

Note

The correction values are set in the factory. These must not normally be altered. However, when the system software is exchanged, the values will be lost and must be re-entered manually.
The correction values are specific to the respective master PCB.

Chapter 9: Troubleshooting

9.1 Troubleshooting Instructions

DANGER

Life danger through electrical shock
When the compass is energized, the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
When the AC main supply is switched on, hazardous life voltages are present at the line filter and the power transformer's terminals.
Be extremely careful when operating the compass while the housing is open. Newer touch the master PCB, the connecting cables to the gyrosphere container or any other conductive components on the container or in the compass housing.
Always exclude any contact to energized components.

CAUTION

Risk of damage of electrostatic-discharge-sensitive components
The NAVIGAT X MK 1 contains electrostatic sensitive components. Electrostatic discharge may permanently damage components.
When servicing the NAVIGAT X MK 1, take considerable precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

The NAVIGAT X MK 1 is a complex electronic system. In case of malfunction, it would neither be practical nor economical to carry out troubleshooting and servicing in the field down to the level of individual circuit components.

Unless instructed otherwise by Sperry Marine engineering, field service personnel should limit troubleshooting to:

- Visual inspection of mechanical components, the master board and wiring.
- Continuity checks of wiring connections.
- Checks for short circuit/overload conditions or reversed polarities. These conditions are indicated by red LEDs on the master board.
- Checking for on-board voltages and I/O signals. The presence of voltages and signals is indicated by green LEDs on the master board. Exact voltage levels must be checked with a voltmeter. The data content on serial I/O lines must be checked with the aid of suitable analyzing tools, such as PC-based protocol interpreters or terminal programs.

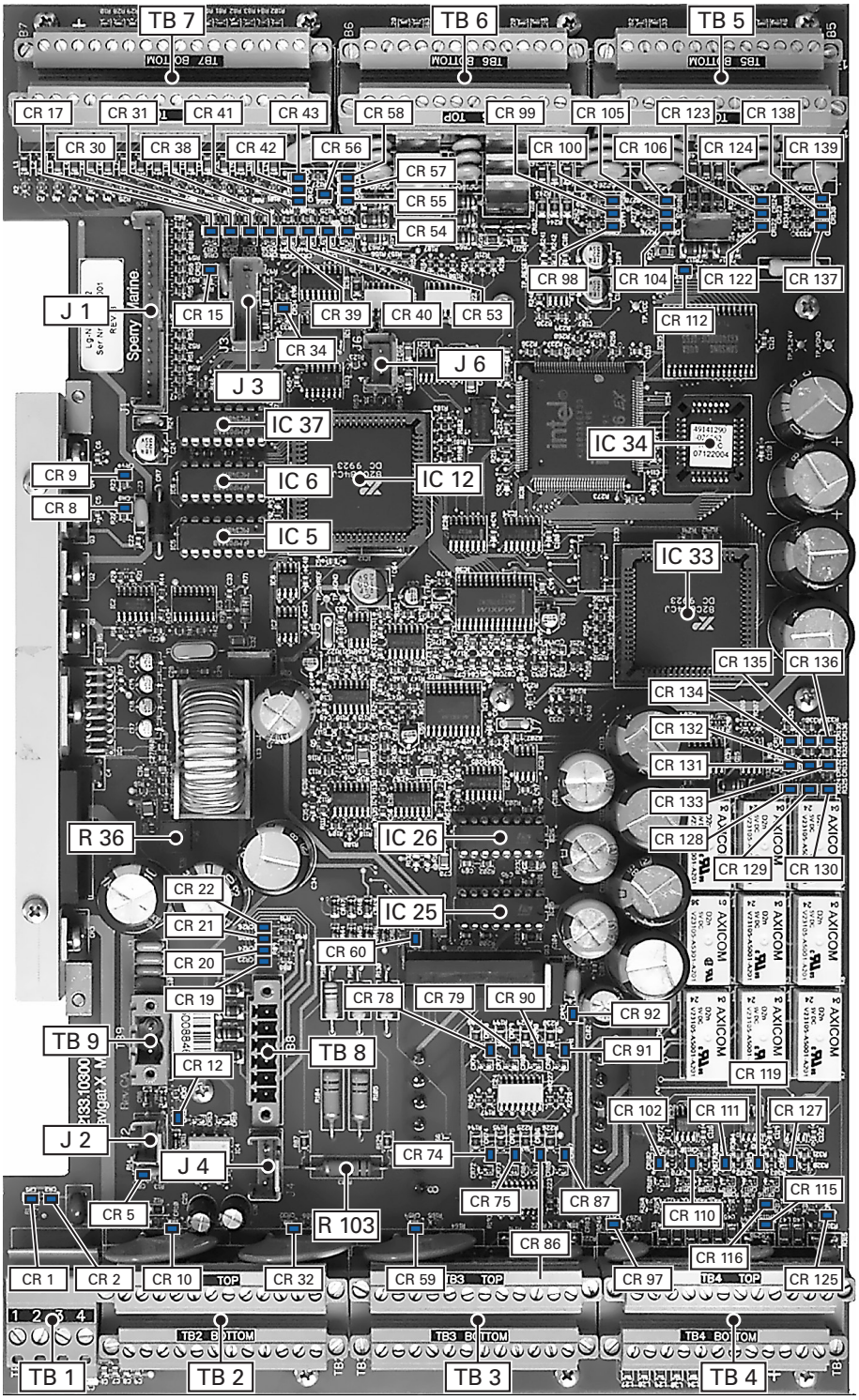
When components on the master board, other than socketed ICs, are assumed to cause malfunction, the complete master board assembly, stock no. 20672, is to be exchanged.

When components on the baseplate assembly are assumed to cause malfunction, the complete baseplate assembly, stock no. 22407, is to be exchanged.

9.2 Location of Parts on the Master PCB

Figure 9-1 below shows the locations of exchangeable components, connectors, trimpots and diagnostic LED indicators on the master PCB.

Figure 9-1: location of parts on the master PCB



Exchangeable Components

Table 9-1: Exchangeable components on the master PCB

Part	Function
IC 5	quad RS-422 output driver IC; drives Sensor Data TB 7.1/7.2 and 7.3/7.4, Compass Monitor, Display units
IC 6	quad RS-422 output driver IC; drives Sensor Data TB 7.5/7.6, SuperFast TB 7.9/7.10, Fast output, nav. data printer
IC 12	UART
IC 25	follow-up motor phase 2 driver IC
IC 26	follow-up motor phase 1 driver IC
IC 33	UART
IC 34	software flash-memory IC, pre-programmed
IC 37	quad RS-422 output driver IC; drives Sensor Data TB 7.13/7.14, SuperFast TB 7.11/7.12

Connectors

Table 9-2: Connectors on the master PCB

TB/J	to/from
TB 1	24 VDC backup supply power in / 24 VDC out
TB 2	relay status outputs (watch al. ackn., G1/G2, G/M, hdg. diff., pwr. fail.), status inputs (op. unit M/R, ROT damping activation for analogue ROT output (via wire link TB 2 3/4), Log/+180°), 200 pulse/nm speed input
TB 3	status inputs (Auto/Man, G1/G2, G/M), rudder angle feedback units fluxgate sensor Switch-Over Unit
TB 4	ext. gyro, Compass Monitor, ext. operating unit speed log NMEA position NMEA Fluxgate NMEA status input (Mute)
TB 5	serial repeaters 1 – 6
TB 6	serial repeaters 7 – 12
TB 7	sensor data outputs, Fast output, SuperFast outputs, 6 step/° outputs, nav. data printer output, analogue rate of turn output

TB/J	to/from
TB 8	follow-up step motor
TB 9	main power supply transformer
J 1	shaft encoder
J 2	cooling fan
J 3	Control and Display Unit
J 4	gyrosphere power supply and pick off contacts
J 6	service interface RS 232 (for factory use only)

Test Resistor / Trimpots

Table 9-3: Test resistor / trimpots on the master PCB

R	to / from
R 103	gyrosphere current test resistor, 1Ω; voltage across R 103 in mV equals gyrosphere current in mA; current should not exceed 500 mA at power-up and must drop below approximately 300 mA within around 45 minutes after power-up
R 36	gyrosphere voltage adjustment (factory-set, normally no adjustment required in the field) Nominal gyrosphere operating voltage is 100 VAC @ 337 Hz. For a present operating voltage of 100 VAC on the master PCB, 105 VAC true RMS at the R 36 potentiometer are necessary.

Diagnostic LEDs

As an aid in troubleshooting, a number of diagnostic LED indicators are provided on the NAVIGAT X MK 1 PCB. These indicate the presence of supply voltages, activities on the serial data I/O lines and the current states of the status I/O ports.

Table 9-4: Diagnostic LEDs

LED	Colour	Indication
CR 1	green	24 VDC backup supply power present
CR 2	red	24 VDC backup supply polarity reversed - swap lines
CR 5	red	overload 24 VDC out to cooling fan - check fan
CR 8	green	+ 12VDC on-board supply present
CR 9	green	+ 5VDC (Vcc) on-board supply present
CR 10	red	overload 24 VDC out TB1.3/1.4
CR 12	green	115/230 VAC main supply power present
CR 15	red	overload 12VDC out to Control and Display unit
CR 17	green	activity on Tx line, nav. data printer

LED	Colour	Indication
CR 23	green	follow-up step motor phase 2 active
CR 24	green	
CR 25	green	follow-up step motor phase 1 active
CR 26	green	
CR 30	green	activity on Tx line, Sens. Data or AD10 clock, TB 7.13/7.14
CR 31	green	activity on Tx line, SuperFast or AD10 data, TB 7.11/7.12
CR 32	red	overload 24VDC out to Switch-Over Unit, TB 3.22
CR 34	green	activity on Rx/Tx line, ext. Display Unit, TB 4.11/4.12
CR 38	green	activity on Tx line, SuperFast, TB 7.9/7.10
CR 39	green	activity on Tx line, Fast output, TB7.7/7.8
CR 40	green	activity on Tx line, Sens. Data, TB 7.5/7.6
CR 41	green	6-step/° output 2, phase 3 active
CR 42	green	6-step/° output 2, phase 2 active
CR 43	green	6-step/° output 2, phase 1 active
CR 53	green	activity on Tx line, Sens. Data, TB 7.3/7.4
CR 54	green	activity on Tx line, Sens. Data, TB 7.1/7.2
CR 55	green	6-step/° output 1, phase 3 active
CR 56	red	overload internal 24VDC 6step/° repeater supply
CR 57	green	6-step/° output 1, phase 2 active
CR 58	green	6-step/° output 1, phase 1 active
CR 59	red	overload 24 VDC out to Switch-Over Unit, TB 3.23
CR 60	green	24 VDC on-board supply to follow-up motor present
CR 74	green	status input closed, Alarm Mute
CR 75	green	status input closed, G1/G2
CR 78	green	status input closed, ext. status (log status or 180° offset)
CR 79	green	status input closed, 200 pulse/nm
CR 83	red	overload 12 VDC out fluxgate sensor
CR 86	green	status input closed, G/M
CR 87	green	status input closed, Auto/Man
CR 90	green	status input closed, analogue ROT output damping
CR 91	green	status input closed, op. unit M/R
CR 92	green	- 12 VDC on-board supply present
CR 97	red	overload 24 VDC out to Compass Monitor
CR 98	red	overload 24 VDC out to repeater 12

LED	Colour	Indication
CR 99	red	overload 24 VDC out to repeater 9
CR 100	red	overload 24 VDC out to repeater 8
CR 102	green	activity on Rx line, Compass Monitor, TB 4.3/4.4
CR 104	red	overload 24 VDC out to repeater 7
CR 105	red	overload 24 VDC out to repeater 10
CR 106	red	overload 24 VDC out to repeater 11
CR 110	green	activity on Rx line, ext. Gyro, TB 4.1/4.2
CR 111	green	activity on Rx line, Magnetic Compass Heading, TB 4.17/4.18
CR 112	green	activity on Tx line, Repeater outputs, TB 5 and 6
CR 115	red	overload 12 VDC out to ext. CDU
CR 116	green	activity on Tx line, Compass Monitor, TB 4.7/4.8
CR 119	green	activity on Rx line, Position, TB 4.15/4.16
CR 122	red	overload 24 VDC out to repeater 6
CR 123	red	overload 24 VDC out to repeater 3
CR 124	red	overload 24 VDC out to repeater 2
CR 125	red	overload - 12 VDC out, TB 4.24
CR 127	green	activity on Rx line, Speed, TB 4.13/4.14
CR 128	green	relay attracted, K1 (watch alarm acknowledge)
CR 129	green	relay attracted, K4 (max. ROT exceeded)
CR 130	green	relay attracted, K7 (heading diff. alarm)
CR 131	green	relay attracted, K2 (status G/M)
CR 132	green	relay attracted, K5 (AC power failure)
CR 133	green	relay attracted, K8 (DC power failure)
CR 134	green	relay attracted, K3 (status G1/G2)
CR 135	green	relay attracted, K6 (power failure and general alarm)
CR 136	green	relay attracted, K9 (G1/G2 to Switch-Over-Unit)
CR 137	red	overload 24 VDC out to repeater 1
CR 138	red	overload 24 VDC out to repeater 4
CR 139	red	overload 24 VDC out to repeater 5

Chapter 10: Corrective Maintenance

DANGER

Life danger through electrical shock
When the AC main supply is switched on, live voltages are present at the line filter and the power transformer's terminals.
When the compass is energized (main and/or backup supply present), the gyrosphere operating voltage of 100 VAC @ 337 Hz is present on the master PCB, the gyrosphere supply lines and across the gyrosphere contacts.
Make sure the compass' main and backup power supplies are always switched off and safeguarded against accidental switching-on when exchanging components on the master board,

CAUTION

Risk of damage of electrostatic-discharge-sensitive components
The NAVIGAT X MK 1 contains electrostatic sensitive components. Electrostatic discharge may permanently damage components.
When servicing the NAVIGAT X MK 1, take considerable precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

The NAVIGAT X MK 1 is generally not field-serviceable on the component level. In case of malfunction, complete sub-assemblies must be exchanged and the defective sub-assemblies returned to Sperry Marine.

Singular electronic components which may be exchanged by field service personnel are the system software IC and the other socketed ICs on the NAVIGAT X MK 1 master board.

10.1 Exchanging the System Software

CAUTION

Risk of loss of parameter settings through software exchange
It cannot be guaranteed that parameter settings in the User and Setup menus and the entries made in the Magnetic Compass Calibration table are left intact when the software is exchanged.
Before exchanging the system software IC, record all parameter settings to be able to re-enter them manually, if required.

The NAVIGAT X MK 1 system software is contained on a flash-memory chip, IC 34, on the master PCB. By exchanging the software IC, the system can easily become upgraded to a newer or downgraded to a previous software release, if required.

Note

The stock number of the pre-programmed software IC, 26562, remains identical through all software releases. The IC's revision identifier indicates which software release it has been programmed with. Unless specified otherwise upon ordering, Sperry Marine will deliver the IC pre-programmed with the latest official software release.

Exchanging the flash-memory IC

Note

The flash-memory IC is a 32-pin PLCC chip. A suitable extractor tool is required to remove the IC from its socket.

Verify that a new flash-memory IC, stock no. 26562, containing software 4914-1090-00 with the required revision identifier and release date has been obtained.

1. While the system is running, take notes of the current settings in the Manual Settings, User and Service Setup menus.
2. Check that all the menu settings have been entered correctly into the setup tables in the appendix of this manual. If necessary, correct and amend the tables.
3. Power down the system.
4. Make sure that both the main and backup supplies are switched off and efficiently safeguarded against accidental switching-on.
5. Remove the cover from the compass housing.
6. Remove the currently installed flash-memory chip (IC 34) from its socket on the master PCB.
7. Insert the new flash-memory IC into the socket.
8. Re-attach the cover to the compass housing.
9. Power up the system.
10. Re-enter all settings in the Manual Settings, User and Service Setup menus, as previously noted in the setup tables in the appendix of this manual.

10.2 Replacing Socketed ICs

While all socketed ICs may be easily exchanged, it will mostly be impossible for field service personnel to trace back malfunction of the system to the failure of a given IC, such as an UART or PAL.

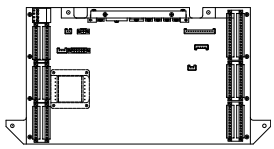
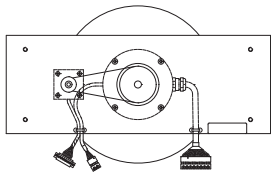
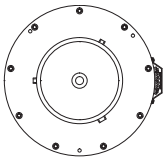
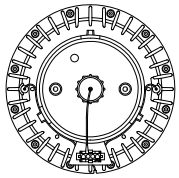
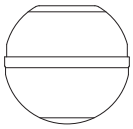
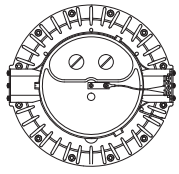
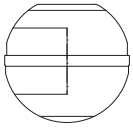
In case of failure of an RS-422 serial data output, however, the reason is mostly a defective driver IC.

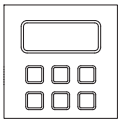
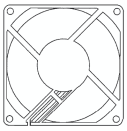
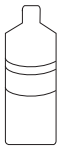
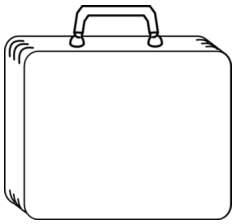
The RS-422 serial data outputs use standard quadruple RS-422 line drivers (MC3487).

Chapter 11: NAVIGAT X MK1 Spare Parts

11.1 Illustrated Parts List (IPL) Overview

Table 11-1: IPL of system component spare parts

Spare Part	Name	Stock No.
	Master PCB	020672-0000-000
	Baseplate, complete	022407-0000-000
	Container, Mod. 7/2 (top view)	022470-0000-000
	Centerpin, Mod. 7/2	029370-0000-000
	Container, Mod. 10/2 (top view)	022418-0000-000
	Gyrosphere, type 2 (mercury)	074571-0000-000
	Centerpin, Mod. 10/2	022383-0000-000
	Container, Mod. 10/3 (top view)	022561-0000-000
	Gyrosphere, type 3 (mercury free)	074829-0000-000

Spare Part	Name	Stock No.
	Centerpin, Mod. 10/3	022575-0000-000
	CDU, insert complete	025738-0000-000
	Cooling fan	026797-0000-000
	Supporting fluid, 1 l btl. (Mod. 10 = 1 btl.; Mod. 7 = 3 btl.)	049050-0000-000
	Gyrosphere installation kit, suitcase*	074695-0000-000 (Mod. 7/2) 074696-0000-000 (Mod. 10/2) 022638-0000-000 (Mod. 10/3)

Note

For the exchange of the cooling fan, stock no. 026797-0000-000, it is not allowed to use standard PC components as spare parts.
Always use original Sperry Marine spare parts only.

Note

* The parts list of the gyrosphere installation kits are appended as documents 004914-0126-000, 004914-0126-001 and 004914-0126-004 in the appendix of this manual.

Abbreviations

Note

The following list contains abbreviations and shortcuts used in this manual and in displayed text of CDU menus.

A

1x1 frame	Standard frame 96x96 mm
6 step/°	scale measure setting of servomotor
A/DO-160	Section A, DO-160E, Environmental Conditions and Test Procedures for Airborne Equipment
ACK	Acknowledge alarms
ADA	Name of a Programming Language
AIS	Automatic Identification System
ANSI	American National Standards Institute
approx.	Approximately
ARS	Attitude Reference System
ASME	American Society of Mechanical Engineers
AZ	Azimuth

B

BD	Baud
Bd.	Baud
BIT	Built In Test
BIU	Bus interface unit
BSH	German Federal Maritime and Hydrographic Agency (BSH)
btl.	Bottle

C

C	Celsius
CA	Correction Angles
CAL.	Calibration
cal. no. s.	Calibration numbers
CCFL	Cold Cathode Fluorescent Lamp

CDU	Control and Display Unit
COG	Course over ground
COMP	Compass
Comp. Mon.	Compass monitor
CONST.	Constant
contd.	Continued
corr.	Correction
CORR.	Correction
cos.	Cosine
CR	Carriage return

D

D00	D00 - D32 (D-Code, = Fault code)
DAC	Digital analogue converter
DC	Direct Current
D-Code	Fault code (D00 - D32)
DGPS	Differential GPS (see also GPS)
dia.	Diameter
diff.	Difference
DIFF.	Difference
DIM	dimmer
DIN	Deutsche Industrie Norm (German Industrial Norm)
Dnn	D00 - D32 (D-Code, = Fault code)
DNV	Det Norske Veritas
DNV Naut-AW	Det Norske Veritas Class notation for enhanced nautical safety
DP	Dynamic positioning
dwg.	drawing

E

E.	East
EC	European Union Council
ECCN	Export Control Classification Number

ECDIS	Electronic Chart Display and Information System
e.g.	exempli gratia
EMC	Environmental conditions
EM-Log	Electromagnetic (speed) log
EN	European Norm
ERR.STAT.BITS	Validity check of fiber-optic sensor data status
ESD	electrostatic discharge
Ext Status In	External status input port (TB 3.11)
ext.	External
Ext. Sel.	External selector switch

F

FIU	Fiber optic interface unit (synonym for IPSU)
FL	Line filter
Flash	Nonvolatile Memory
FMEA	Failure mode effect analysis
FOG	Fiber optic gyro
FRAM	Ferro Electrical RAM (None volatile RAM)
FU	Follow up

G

G	Gyrocompass, single gyrocompass system
G1	Gyrocompass 1
G2	Gyrocompass 2
GAS	Grounding avoidance system
Gen.	General
GG	Dual gyrocompass system
GGA	NMEA sentence providing the GPS current fix data
GGM	Dual gyrocompass/Magnetic compass system
GL	Germanischer Lloyd
GLL	Geographic position - latitude/longitude
GM	Gyro- /Magnetic compass system

G/M headings	Gyro /Magnetic compass headings
GMDSS	Global Maritime Distress and Safety System
Gnd	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GPS/AIS	Global Positioning System / Automatic Identification System
GT	Gross tonnage

H

HCS	Heading control system
HDG	Heading, Magnetic
Hdg.	Heading
hdg.	Heading
Hdg. Diff	Heading Difference (Alarm)
Hdg. Sel	Heading selection; Selection of heading source device
HDG/G	Heading/Gyro
HDT	Heading, True
HMS	Heading management system
HSC	High speed craft
HSC-2000	Class notation for high speed craft
HTC	Heading track control
Hz	Hertz

I

I/O	Input/Output
IC	Integrated circuit
ICD	Interface Control Document
ID	Identifier
i.e.	id est
IEC	International Electro Technical Commission
IHO	International hydrographic office.
IMO	International Maritime Organization

IMU	Inertial Measurement Unit
INS	Integrated navigation system
INT HDG ONLY	Internal heading only
INT/EXT HDG	Internal or external heading
IP	International Protection
IPD	Illustrated Parts Data
IPL	Illustrated Parts List
IPSU	Interface and power supply unit
ISO	International Organization for Standardization

J

J	Jack (connector)

K

KF	Kalman Filter
Kt.	Knots
kt.	Knots
kts.	Knots

L

LAT	Latitude
Lat.	Latitude
lat.	Latitude
LCD	Liquid crystal display
LED	Light Emitting Diode
LEHMK	Lehmkuhl (transmission standard company Lehmkuhl)
LF	Line feed
LFK	Litef Faser Kreisel (Litef fiber optic gyroscope)
lin.	Linear
lon.	Longitude
Lon.	Longitude
LORAN	Long Range Navigation

LORAN-C	Long Range Navigation C
LSB	Least significant Bit

M

m	Meter
Mag	Magnetic
Mag Hdg. Inp.	Magnetic compass heading input
MAGN.	Magnet
Magn. Cal. Tab	Magnetic compass calibration table
Magn. DEV	Magnetic deviation
Magn. VAR	Magnetic variation
MAN.	Manually
MarED	Marine Equipment Directive
max.	Maximal
MED	Marine Equipment Directive
MIN	Minute
min	Minute
min.	Minimal
MMS	Mechanical mode switch
Mod.	Modul
Mod.	Modus
Mod. 10/2	Gyrocompass container model 10/2
Mod. 10/3	Gyrocompass container model 10/3
Mod. 7/2	Gyrocompass container model 7/2
MSB	Most significant Bit
MSC	Maritime Safety Committee
MTBF	Mean time between failure

N

N.	North
NAUT-AW	Class notation for enhanced nautical safety
Naut-HSC	Class notation for high speed craft

Nav.	Navigation
NFU	None follow up
NG	NAVIGAT
N Gyro	North gyro
nm	Nautic mile
NM	Nautic mile
NMEA	National Marine Electronics Association
NMEA	NMEA format 4800 Bd
NMEA $--HDG	NMEA $--HDG sentence
NMEA $--HDM	NMEA $--HDM sentence
NMEA $--HDT	NMEA $--HDT sentence
NMEA Sup.FAST	SuperFAST serial data output
NMEA-GGA	NMEA-GGA sentence
NMEA-GLL	NMEA-GLL sentence
NMEA-HCHDG	NMEA-HCHDG sentence
NMEA-HCHDM	NMEA-HCHDM sentence
NMEA-HCHDT	NMEA-HCHDT sentence
NMEA-HDG	NMEA-HDG sentence
NMEA-HDM	NMEA-HDM sentence
NMEA-RMA	NMEA-RMA sentence
NMEA-RMC	NMEA-RMC sentence
n.o.	Normally open
No.	Number
NVR	None Volatile RAM

O

Off Hdg	Off heading alarm
Offs.	Offset
op.	Operational
OUTP	Output

P

p.	Pulse
Ph.	Phase
P.Gnd	Power ground
P/N	Part number
PAL	Pre-programmed IC
PCB	Printed circuit board
PLATH	Binary protocol of company C. Plath
PLCC	Plastic leaded chip carrier
POS	Position
POSITION N	No position

Q

QUICC	Quad Integrated Communications Controller
QUART	Quad Universal Asynchronous Receiver and Transmitter

R

RAC	Rudder angle calibrator
RADAR	Radio Detection and Ranging
RAI	Rudder angle indicator
RAM	Random Access Memory
Ref. Voltage	Reference voltage
RM	Recommended minimum navigation information
RMA	Recommended minimum navigation information NMEA sentence A
RMB	Recommended minimum navigation information NMEA sentence B
RMC	Recommended minimum navigation information NMEA sentence C
RMS	Root mean square
ROM	Read Only Memory
ROR	Rudder order status
ROT	Rate of turn
ROTI	Rate of turn indicator
rpm	Revolutions per minute

RRR	Russian River Register
RS-422	RS-422 serial data interface standard
RSA	NMEA sentence for rudder set angle
RUD	rudder angle graph

S

S.	South
s	Second
sc.	Scaling
S/FAST M. Outp.	Superfast / fast data output of magnetic compass heading
SAT-Log	Satellite (speed) log
sc. Factor	Scale factor
SCU	Steering control unit
SEC	Second
sec	Second
SENS.D.M.OUTP.	Output sentence format for magnetic compass heading at the sensor data output
Sentence	A self-contained line of data
SFA unit	Steering failure alarm unit
S Gyro	South gyro
sin.	Sine
SMS	Steering mode switch
SOG	Speed over ground (actual measured speed of advance of a vessel over the surface of the earth)
SOLAS	Safety of life at sea
SoS	Scope of supply
SOU	Switch-over unit
Sp.	Speed
SPEED N	No speed
SRAM	Static RAM
SRD	Abbreviation for speed log
Stat.	Status
stb.	Starboard
STW	Speed through water (ship's speed, as measured relative to the water).

SUSI	Sperry universal service instrument
SVDR	Simplified voyage data recorder
SW	Software

T

t.	Time
TB	TB 3.11 (external input port)
TB	Terminal block
THS	True heading and status
THS	Transmitting heading system
Temp.	Temperature
TMC	Transmitting magnet compass
TMC function	Transmitting magnet compass function
TSS1	TSS1 protocol; Heading, pitch, roll, and heave message in the commonly used TSS1 message format
TTL	Transistor-transistor-logic
TxD NMEA FAST	Fast serial data output

U

UART	Universal asynchronous receiver transmitter
UDR	Universal digital repeater
UML	Unified Modelling Language
USCG	United states coast guard

V

V	Volt
VAC	Volt alternating current
Val.	Values
VDC	Volt direct current
VDR	Voyage data recorder
Ver.	Version
VHW	Water speed and heading
VMS	Voyage management system

VMS/ECDIS	Voyage management system / electronic chart display and information system
VOSS	Vessel optimization & safety system
Vpp.	Voltage peak to peak
VTG	Velocity through ground
VTS	Vessel traffic service

W

W	Watt
W.	West
w.	with
w/	with
W/DO-160	Section W, DO-160E, Environmental Conditions and Test Procedures for Airborne Equipment
w/o	without

X

X rate	Roll rate
X/Y rates	Roll and pitch rates

Y

Y rate	Pitch rate

Z

Z/DO-160	Section Z, DO-160E, Environmental Conditions and Test Procedures for Airborne Equipment

Appendix

A Setup and Configuration Tables

The following Setup and Configuration Tables (blank forms) are to be used for recording all parameter settings for archiving purposes and for being able to re-enter them manually, if required.

The Installation Checklist / Record Sheet is mandatory to successfully finish and record the installation procedures of the NAVIGAT X MK 1 system

Designation	Drawing No.
NAVIGAT X MK 1: Preferred Operational Settings	4914-0125-01
NAVIGAT X MK 1: Setup Table	4914-0125-02
NAVIGAT X MK 1: Magnetic Compass Calibration Table	4914-0125-03
NAVIGAT X MK 1: Installation Checklist / Record Sheet	4914-0125-10
Gyrocompass Installation Kit Mod 7 074695-0000-000	4914-0126-00
Gyrocompass Installation Kit Mod 10 074696-0000-000	4914-0126-01
Gyrocompass Installation Kit Mod 10/3 022638-0000-000	4914-0126-04

CAUTION

Risk of loss of parameter settings through software exchange
It cannot be guaranteed that parameter settings in the User and Setup menus and the entries made in the Magnetic Compass Calibration table are left intact when the software is exchanged.
After installation of the NAVIGAT X MK 1 and before any exchanging the system software IC, record all parameter settings in the setup and configuration tables to be able to re-enter them manually, if required.

Note

It is advisable to copy the blank forms of the Setup and Configuration Tables to have editable blank forms at hand for recording purposes. Archive filled-out Setup and Configuration Tables and keep them together with the system manual in a wellknwon, readily available location nearby the NAVIGAT X MK 1.

Note

After installation of the NAVIGAT X MK 1, please return a filled-out copy of the Setup Table to Sperry Marine for inclusion in the ship's file.
When permanent changes are made to the system configuration, please return an updated copy of the Setup Table to Sperry Marine.

B Drawings

The following drawings are part of the appendix of this manual:

Designation	Drawing No.
Dimension Drawing: Gyrocompass NAVIGAT X MK 1	4914-0112-02
Wiring Diagram: NAVIGAT X MK 1	4914-0115-01
Dimension Drawing: Operating Unit	4926-0112-01
Standard Connection Drawing: Gyrocompass System NAVIGAT X MK1 without NAVITWIN IV, with new Repeater	4914-0253-15
Standard Connection Drawing: Single Gyrocompass / TMC System NAVIGAT X MK1 with NAVITWIN IV, SOU	4932-0353-67
Standard Connection Drawing: Dual Gyrocompass System NAVIGAT X MK1 with NAVITWIN IV (GAS), SOU	4932-0353-54
Standard Connection Drawing: Dual Gyrocompass System NAVIGAT X MK1 with NAVITWIN IV, SOU	4932-0353-76
Standard Connection Drawing: Triple Gyrocompass System NAVIGAT X MK1 with NAVITWIN IV, 2 x SOU	4932-0353-68

Note

All appended drawings are revision-controlled separately at Sperry Marine. In case of doubt, verify the current revision status of the drawings with Sperry Marine. This manual's revision status does not automatically change in time in case the revision of an appended drawing changes.

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NAVIGAT X MK 1 Preferred Operational Settings

Vessel: _____	Hull No.: _____
IMO No.: _____	Shipyard: _____
Service Station / Installer: _____	Date / Signature: _____ /

Note

Make copies of this form to note the appropriate settings in the Manual Settings and User Setups for normal operation of the equipment.
In general, automatic data input modes should be chosen in preference of manual input, wherever possible.

Manual Settings

Speed/Lat Mode	Speed Mode:		Posit Mode:	
	❍ **AUTO**	❍ **MAN**	❍ **AUTO**	❍ **MAN**
Speed/Lat Set	**Man Speed Value: _____ kts.**		**Man Lat. Value: _____ N / S**	
Hdg. Diff. Alarm	Between:			
	❍ **GY1/GY2**	❍ **GY1/MAG**	❍ **GY2/MAG**	❍ **OFF**
	Diff. Alarm Threshold Value: _____ °			
Magnetic Variation Mode	❍ **AUTO**	❍ **MAN**		
	Man. Variation Value: _____ ° W/ E			
North Sp. Err. Corr.	❍ **ON**	❍ **OFF**		
Settings NAVIPRINT	❍ **ON**	Paper Speed	Heading	Rudder
	❍ **OFF**	❍ **60 mm/h**	❍ **± 30°**	❍ **± 9°**
		❍ **150 mm/h**	❍ **± 180°**	❍ **± 45°**
		❍ **600 mm/h**		❍ **± 70°**
				❍ **OFF**
Settings ROT	Time Const. ROT:		Max. Value ROT:	
	Time Constant: _____ s		**Max. Value: _____ °/min.**	

User Setup

Date and Time Mode	❍ **AUTO**	❍ **MAN**		
Software Version	**Master Board: _____**		**Display Board: _____**	
Mag. C. Cal. Table	❍ **ON**	❍ **OFF**		

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NAVIGAT X MK 1 Setup Table

Vessel: _____	Hull No.: _____
IMO No.: _____	Shipyard: _____
Service Station / Installer: _____	Date / Signature: _____ / _____

Note

After installation of the NAVIGAT X MK 1, please return a filled-out copy of the Setup Table to Sperry Marine for inclusion in the ship's file. When permanent changes are made to the system configuration, please return an updated copy of the Setup Table to Sperry Marine.

Service Setup 1 (Code 600)

Interface I/O

Gyro Input	❍ PLATH	❍ LEHMK. 1200	❍ LEHMK. 2400	❍ LEHMK. 4800
	❍ LEHMK. 9600	❍ NMEA-HDT	❍ OFF	
Mag Hdg Input	❍ SIN COS	❍ NMEA-HDM	❍ NMEA-HCHDT	❍ NMEA-HDG
	❍ PLATH-MAGN	❍ NAVIPILOT	❍ COMP. MONITOR	❍ OFF
Speed Input	❍ 200 Pulse/NM	❍ NMEA		
Pos. Input	❍ NMEA-GLL	❍ NMEA-GGA		
Sens. D. M. Outp.	❍ NMEA-HCHDM	❍ NMEA-HCHDT	❍ NMEA-HCHDG	
S/Fast M. Outp.	❍ NMEA-HCHDM	❍ NMEA-HCHDT		
Magn. Variation	❍ NMEA-HDG	❍ NMEA-RMA	❍ NMEA-RMC	
NMEA SuperFast	❍ 4800 BAUD	❍ 9600 BAUD	❍ 19200 BAUD	❍ 33 Hz 38400 BD
	❍ 50 Hz 38400 BD	❍ NMEA-HCHDT	❍ PLATH	❍ COURSEBUS
TxD NMEA Fast	❍ NMEA	❍ HCHDT	❍ HDT/ROT	❍ PLATH
				❍ COURSEBUS

Analog ROT Outp.

Settings	sc. factor: _____ mV/°/min	zero offset: _____ mV

Feedback Signal

No. of Rudders	❍ 1	❍ 2		
Set Rudder 1	sc. factor: _____ mV/°/min		zero offset: _____ mV	
Set Rudder 2	sc. factor: _____ mV/°/min		zero offset: _____ mV	

System Type

System	❍ G	❍ GM	❍ GG	❍ GGM
Hdg. Sel.	❍ CDU 1	❍ CDU 1+2	❍ COMP. MON.	❍ AUTOPILOT
	❍ EXT. SEL.			

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Align Err. Corr.				
Setting	**corr. value: _____ °**			
Shaft. Cor. Angle				
Setting	**corr. value: ____ °**			
Ext. Status In				
Status Log TB2.23	❍ **STAT. LOG**	❍ **STAT. HDG +180°**		
Enable 180° Offs.	**GYRO1 +180°** ❍ **OFF** / ❍ **ON**	**GYRO2 +180°** ❍ **OFF** / ❍ **ON**	**MAGN +180°** ❍ **OFF** / ❍ **ON**	
Name of Gyro				
ID-No.	❍ **1**	❍ **2**	❍ **3**	
Test Mode				
Settings:	**rate of turn: _____ °/min**		**heading value: _____ °**	
	change settings:	**time const.:** **_____ s**	**sc. factor:** **__ ____ mV/°/min**	**zero offset:** **_____ mV**
Gen. Alarm Setup				
Alarm relay active:		❍ **ON ALL ALARMS**	❍ **ON FATAL ALARMS**	
Protocol Type				
THS/HDT	**SENSORDATA** ❍ **OFF** / ❍ **ON**	**FAST** ❍ **OFF** / ❍ **ON**	**SUPERFAST** ❍ **OFF** / ❍ **ON**	**REPEATER** ❍ **OFF** / ❍ **ON**
IEC/NMEA:	❍ **IEC**	❍ **NMEA**		
AD10 Usage				
AD10 hdg. output setting:		❍ **OFF**	❍ **ON**	
K1 Mute / Hdg.-Diff.				
K1 alarm relay functionality:		❍ **MUTE**	❍ **HDG-DIFF**	
Speed Filter				
Settings	**time const.: _____ s**			
	speed min.: _____ kn		**speed max.: _____ kn**	
ROT Filter				
Settings	**time const. for serial ROT outputs: _____ sec**			

Technical Pages (Code 140)

Software Version				
Settings	**Hardware:** _____	**SW. Ver:** _____	**Masterboard:** _____	**Display Board:** _____
Correction Val.				
Settings	**corr. val. temp: _____ °**		**gyro current gain: _____ °**	

Note

Make sure to re-enter the correction values when updating the system software.
Correction values are specific to the master PCB installed.
When exchanging a master PCB, read out the correction values and update this setup table to reflect the new values.

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NAVIGAT X MK 1
Magnetic Compass Calibration Table

Vessel: _____	Hull No.: _____
IMO No.: _____	Shipyard: _____
Service Station / Installer: _____	Date / Signature: _____ / _____

Magnetic Compass Hdg.	Magnetic Hdg. Display (uncalibrated)	Correction Value	Magnetic Compass Hdg.	Magnetic Hdg. Display (uncalibrated)	Correction Value
0.0			180.0		
10.0			190.0		
20.0			200.0		
30.0			210.0		
40.0			220.0		
50.0			230.0		
60.0			240.0		
70.0			250.0		
80.0			260.0		
90.0			270.0		
100.0			280.0		
110.0			290.0		
120.0			300.0		
130.0			310.0		
140.0			320.0		
150.0			330.0		
160.0			340.0		
170.0			350.0		

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NAVIGAT X MK 1
Installation Checklist/Record Sheet

Name of Vessel:	_____	Hull No. of Vessel:	_____
IMO No. of Vessel:	_____	Place of Installation:	_____
Type of installed Gyrocompass System:		Single: ❍ Dual: ❍ Triple: ❍	
Serial No. of installed Gyrocompass(es):	_____	_____	_____
Installation Company / Name of Installer:		Date of Installation:	
_____		_____	

Note After installation of the NAVIGAT X MK 1 system please return a filled-out copy of this Checklist to Sperry Marine for inclusion in the ship's file.

Installation Checklist (mark off all applicable check boxes)

Mechanical Installation	
NAVIGAT X MK 1 gyrocompass housing is correctly mounted on a stable, level surface.	❍
Recommended install distances are kept and sufficient space is provided around the housing position to open the door and enable service work to be carried out.	❍
Adequate ventilation at place of installation is assured.	❍
The exact alignment error of the install position is noted for a possible adjustment of the alignment error correction in the Service Setup 1 later on.	❍
Remarks:	

Electrical Installation	
The NAVIGAT X MK 1 gyrocompass is correctly configured for the power supply present.	❍ 230 VAC ❍ 115 VAC
All wiring of the NAVIGAT X MK 1 gyrocompass system components is performed according to standard or project specific connection drawings.	❍
All wiring cables are fitted with the applicable cable screens and all cable screens are correctly connected.	❍
All wiring cables are correctly connected to the screw-down terminals of the Master PCB.	❍
All the ship's cable are correctly inserted through the inlets of the compass housing (wires connecting to TB1 – TB4 through left hand side inlets, wires connecting to TB5 – TB7 through right hand side inlets)	❍
All wires running inside the housing are as short as possible and no wires run from one side across to the other.	❍
All NAVIGAT X MK 1 gyrocompass system components are correctly grounded according to standard or project specific connection drawings.	❍
All the inner cable screens are connected to system ground of interfacing equipment.	❍

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Electrical Installation (continued)	
A 24 V backup supply voltage floating relative to the ship's ground is installed to the NAVIGAT X MK 1 gyrocompass.	❍
Remarks:	

System Configuration	
After energizing the system a startup message is displayed and the initial self test is successfully executed.	❍
In the Service Setup 1: The system type and heading reference selection settings are set to the required values of the gyrocompass system installed.	❍
The data formats for all devices connected to the data inputs are set as required. The magnetic heading input is disabled in a G or GG type system. The external gyro input is disabled in a G or GM type system.	❍ ❍ ❍
All the data output formats and IEC 61162/NMEA protocol standard settings are set as required.	❍
The min./max. limits for the speed filter are well outside the possible range of the vessel's operating speed. In high-speed craft, the max. speed value is sufficiently increased.	❍ ❍
The parameters for the analogue rate of turn output, the status in- and outputs and the rudder angle feedback inputs are correctly set, if required.	❍
In the Manual Settings menu: Operational parameters are set to suitable values. Automatic data input is selected with preference of manual input.	❍ ❍
In the User Setup menu: The current date and time is entered correctly.	❍
All gyrocompass system components functions are tested fully functional in operation with the Service Setup 1 test mode.	❍
The existing alignment, roll and pitch errors are correctly determined and the error correction is correctly applied.	❍
Remarks:	

Herewith, I confirm that the installation of the NAVIGAT X MK 1 Gyrocompass System has been performed in strict accordance with the SPERRY Marine Installation Guidelines and any other applicable installation instructions.

Name of authorized installing person in block letters: _____

Signature of authorized installing person: _____

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Parts List
Gyrocompass Installation Kit Mod. 7
074695-0000-000

Part No.	Qty.	Description	Ref.
047976-0000-000	1	Case	1
049050-0000-000	3	Supporting Fluid, 1l	2
033347-0000-000	1	Plastic Bowl	3
046547-0000-000	1	Funnel	4
034665-0000-000	1	Syringe	5
034664-0000-000	1	Cannula	6
025550-0000-000	1	Stainless Steel Wool Pad	7
047252-0000-000	1	Sticker	8
004914-0126-000	1	Parts List	9

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Parts List
Gyrocompass Installation Kit Mod. 10
074696-0000-000

Part No.	Qty.	Description	Ref.
047976-0000-000	1	Case	1
049050-0000-000	1	Supporting Fluid, 1l	2
033347-0000-000	1	Plastic Bowl	3
046547-0000-000	1	Funnel	4
034665-0000-000	1	Syringe	5
034664-0000-000	1	Cannula	6
025550-0000-000	1	Stainless Steel Wool Pad	7
047252-0000-000	1	Sticker	8
004914-0126-001	1	Parts List	9

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Parts List
Gyrocompass Installation Kit Mod. 10/3
022638-0000-000

DRAWING No. 4914-0126-04	STOCK No. 004914-0126-004
NAME	Fi.
DATE	21.03.2011
ECO-No.	983079
REV.	A1

Gyrosphere Installation Kit 022638-0000-000, comprising:

Part No.	Qty.	Description	Ref.
047976-0000-000	1	Case	1
049050-0000-000	1	Supporting Fluid, 1l	2
033347-0000-000	1	Plastic Bowl	3
046547-0000-000	1	Funnel	4
025550-0000-000	1	Stainless Steel Wool Pad	5
004914-0126-004	1	Parts List	*not shown*

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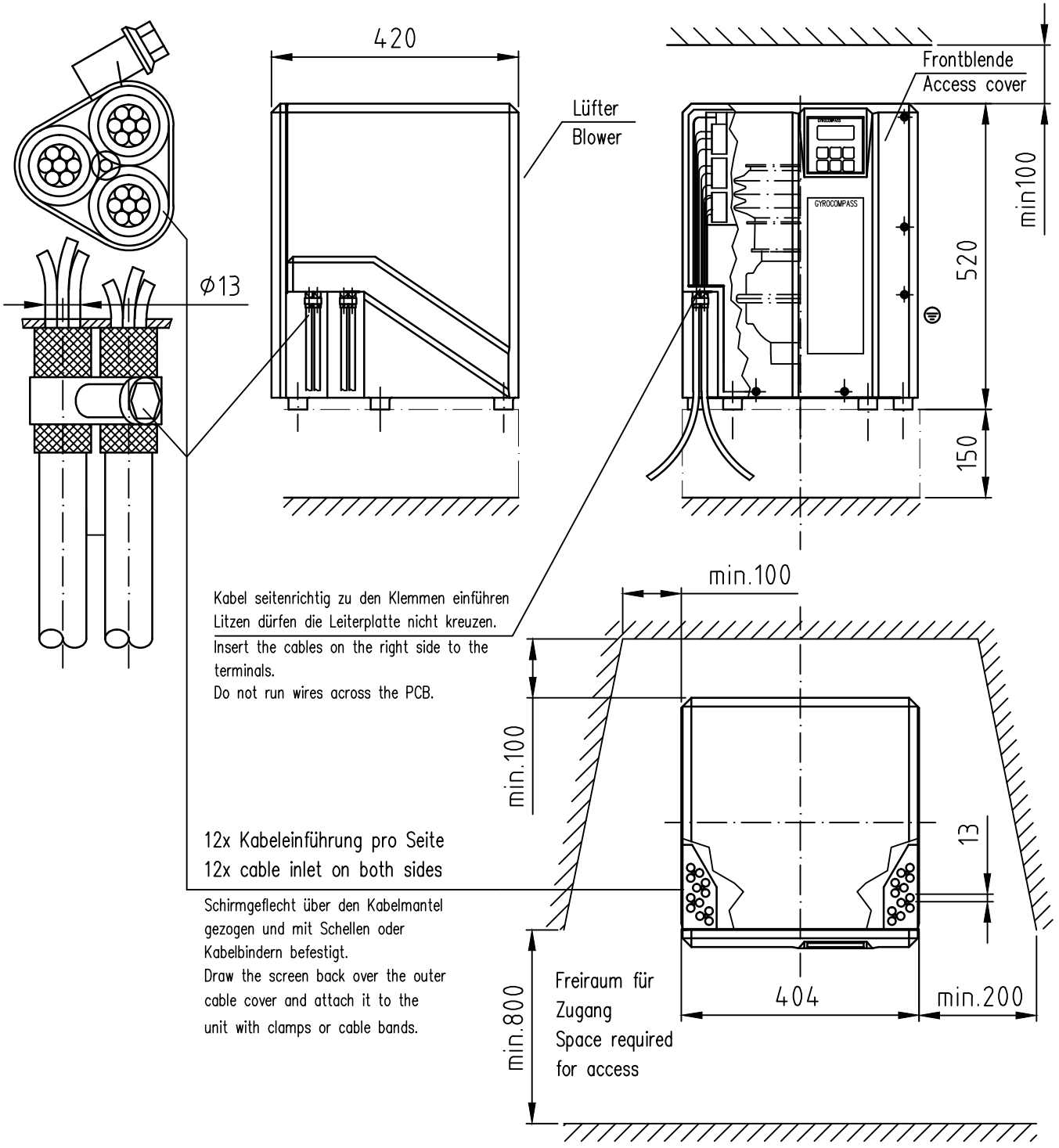

Type	Lager Nr. Stock No.	
4914-CA	74807	
4914-CC	74811	with dynamic north speed error correction

Gewicht/Weight : 25 kg (Mod.10)
28 kg (Mod.7)
Schutzart/Protection grade : IP 23

REV	ECO-No.	DATE	NAME
E	983563	09.08.12	Kie
D1	983482	14.05.12	Ren
D	982928	06.09.10	Kie
C	982876	28.06.10	Kie
B	981480	10.01.05	Ho.
AA	991342	21.06.04	Kie

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Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	12.05.2004	Kie
CHD	see ECO	
DOS	4914-0112-021	

DRAWING No.
4914-0112-02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. see above

DIMENSION DRAWING
Gyrocompass
NAVIGAT X MK 1

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 3

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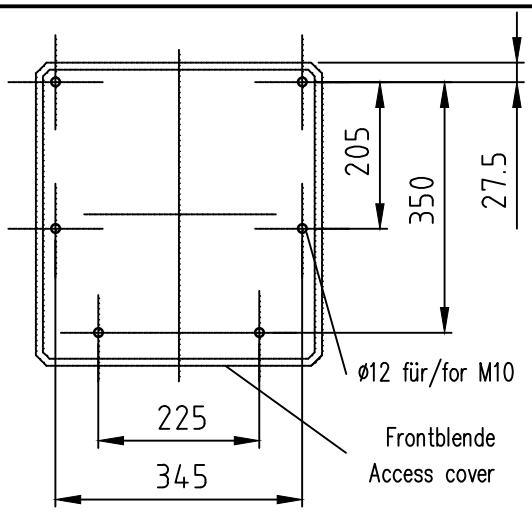

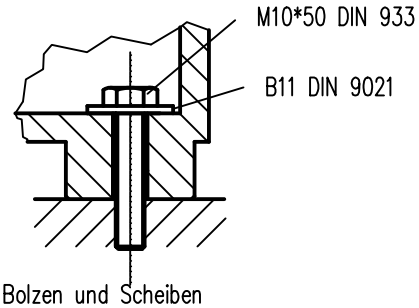

Bolzen und Scheiben
Werftbeistellung
Bolts and washers supplied
by the shipyard

Empfohlener Aufstellungsort:
Auf der Schiffsmittelachse sowie auf Höhe des Hauptdecks oder darunter.
Der Kompaß kann beliebig zur Schiffslängsachse installiert werden, die A-Fehlerkorrektur erfolgt über das Bediengerät.

PREFERED LOCATION:
ON THE CENTERLINE OF THE SHIP AND ON HEIGHT OF THE MAIN DECK OR BELOW.
THE GYROCOMPASS MAY BE INSTALLED AT ANY ANGLE TO THE SHIP'S LONGITUDINAL AXIS. ALIGNMENT ERROR WILL BE CORRECTED WITH THE CONTROL UNIT.

Magnetischer Schutzabstand MAGNETIC CLEARANCE	Mutterkompaß MASTER COMPASS	Tochterkompaß REPEATER COMPASS	Bediengerät CONTROL UNIT
Mindestabstand vom: MINIMUM CLEARANCE TO:			
Magnet–Regelkompaß STANDARD MAGNETIC COMPASS	0,60 m	0,70 m	0,40 m
Magnet–Steuerkompaß STEERING MAGNETIC COMPASS	0,40 m	0,45 m	0,30 m
Reduzierter Mindestabstand vom: MINIMUM CLEARANCE (REDUCED) TO:			
Magnet–Regelkompaß STANDARD MAGNETIC COMPASS	0,30 m	0,45 m	0,30 m
Magnet–Steuerkompaß STEERING MAGNETIC COMPASS	0,30 m	0,30 m	0,30 m

REV	ECO–No.	DATE	NAME
E	983563	09.08.12	Kie
D1	983482	14.05.12	Ren
D	982928	06.09.10	Kie
C	982876	28.06.10	Kie
B	981480	10.01.05	Ho.
AA	991342	21.06.04	Kie

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HAMBURG GERMANY

	DATE	NAME
DRAWN	12.05.2004	Kie
CHD	see ECO	
DOS	4914-0112-022	

DRAWING No. 4914–0112–02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. /

DIMENSION DRAWING
Gyrocompass
NAVIGAT X MK 1

REPLACEMENT FOR:

FREE SCALE:
DIN ISO 2768 mH

SCALE /

SHEET 2
SHEETS 3

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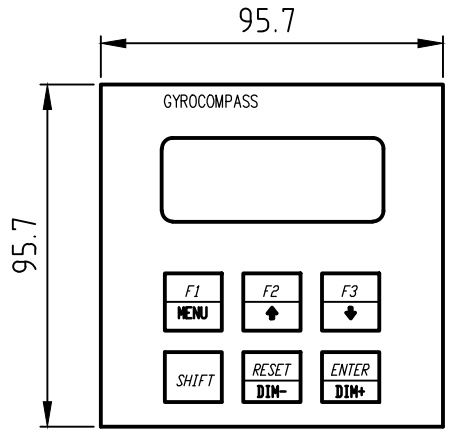
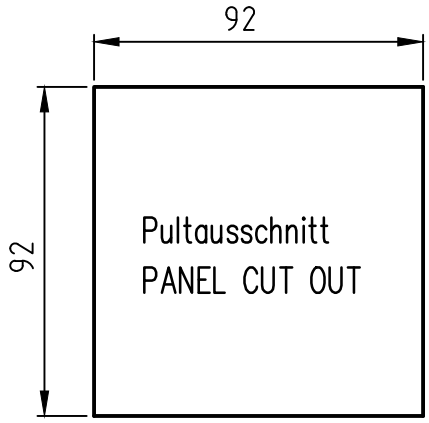
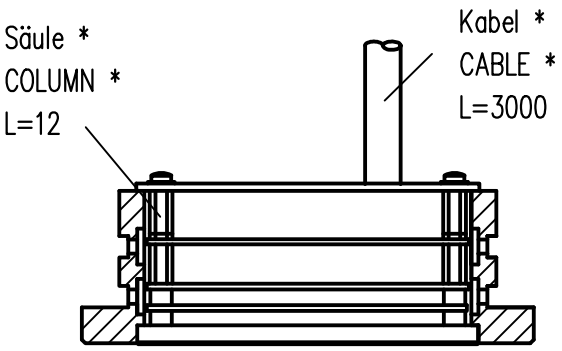
Einbauvorschlag für externe Montage des Bediengeräts:

SUGGESTED INSTALLATION FOR A REMOTELY LOCATED CONTROL AND DISPLAY UNIT:

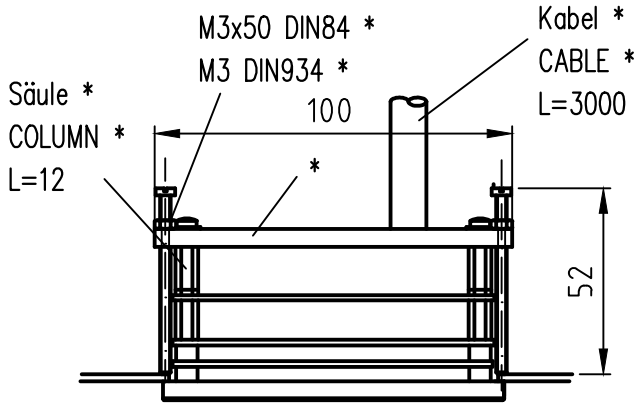






Einbau in Sperry Marine Pultrahmen

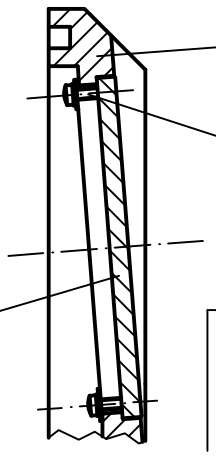
INSTALLATION IN SPERRY MARINE CONSOLE FRAME



Pulteinbau

PANEL INSTALLATION

Einbau der Blindplatte
INSTALLATION OF
A BLANK COVER



* = Montagesatz 26890 (optional)
INSTALLATION KIT 26890 (OPTIONAL)

REV	ECO-No.	DATE	NAME
E	983563	09.08.12	Kie
D1	983482	14.05.12	Ren
D	982928	06.09.10	Kie
C	982876	28.06.10	Kie
B	981480	10.01.05	Ho.
AA	991342	21.06.04	Kie

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	12.05.2004	Kie
CHD	see ECO	
DOS	4914-0112-023	

DRAWING No. 4914-0112-02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. /

DIMENSION DRAWING

Gyrocompass

NAVIGAT X MK 1

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 3

SHEETS 3

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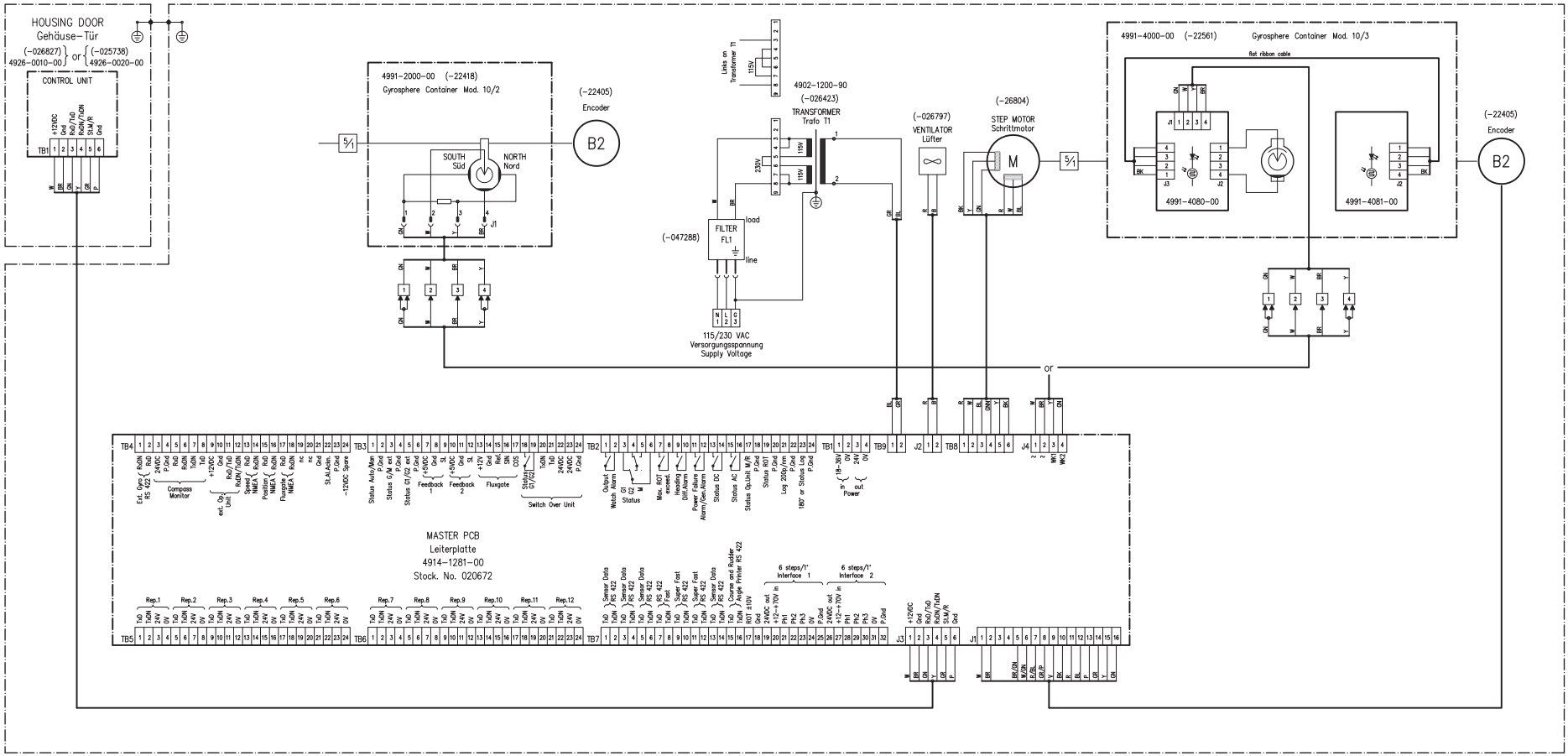


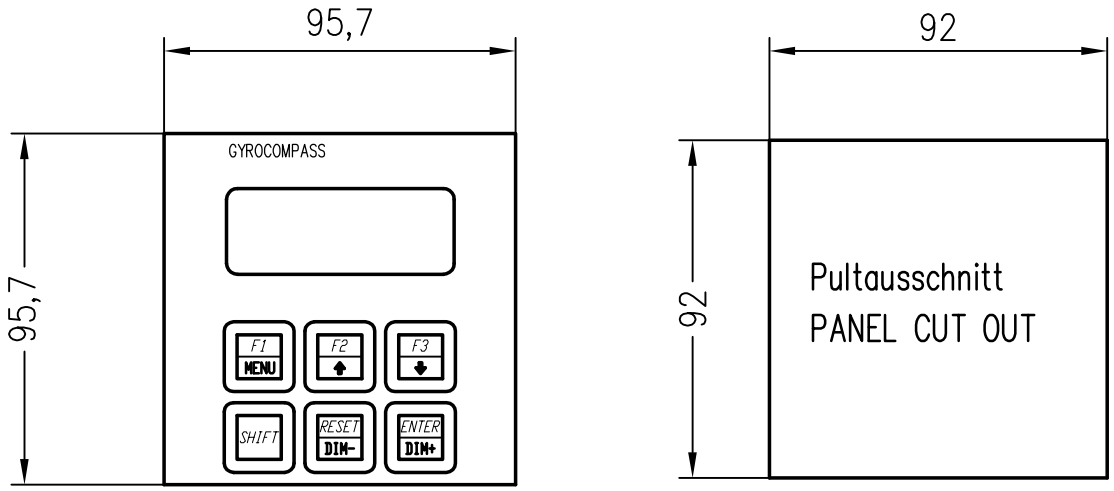
				NORTHROP GRUMMAN		Date	Name
D	983 256	20.10.11	Sung	Sperry Marine	DRAWN	03.06.1998	Geisler
C	981 831	19.06.06	Geisler	Hamburg Germany	DESIGN	03.06.1998	Schiltze
B	981 371	09.05.05	Schütt	01150124\4914–0115–01C5D1	CHD ECO		
AD	99948	19.11.98	Geisler				
AC	99934	28.09.98	Geisler				
AB	99936	21.08.98	Geisler				
AA	–	03.06.98	Geisler	STOCK No.			
REV	ECO–No.	DATE	NAME				

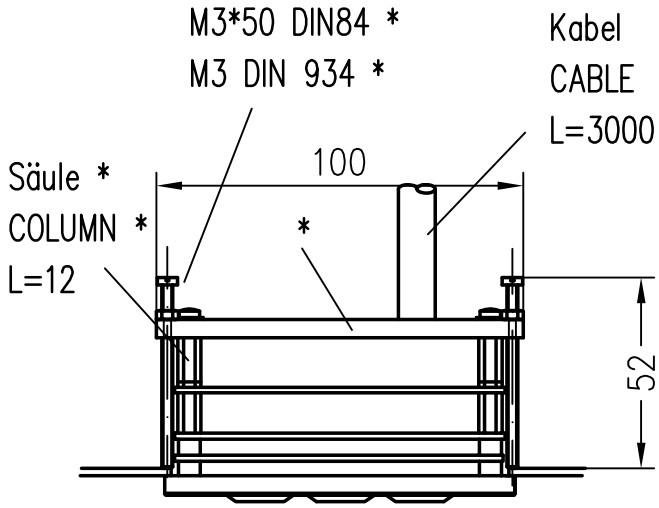
TITLE
Wiring Diagram
NAVIGAT X MK 1

DRAWING No.
4914–0115–01 /D

SHEET 1
SHEETS 1

© NORTHROP GRUMMAN SPERRY MARINE 03.06.1998
Each modification of this drawing requires the approval from NORTHROP GRUMMAN SPERRY MARINE HAMBURG in written form.





Pulteinbau
PANEL MOUNTING

* = Montagesatz 26891 (optional)
MOUNTING KIT 26891 (OPTIONAL)

Gewicht/WEIGHT: 0,25 kg

Type	Stock No.
4926	74631
4926-AC	74900

REV	ECO-No.	DATE	NAME
B1	983256	20.10.11	Hinr.
B	981428	20.10.04	Ho.
AA	99934	30.09.98	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	11.09.1998	Ho.
CHD	see ECO	
DOS	4926-0112-01	

DRAWING No. 4926-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 074631-0000-000

DIMENSION DRAWING
Bediengerät
CONTROL UNIT
Gyrocompass NAVIGAT X MK 1

REPLACEMENT FOR:

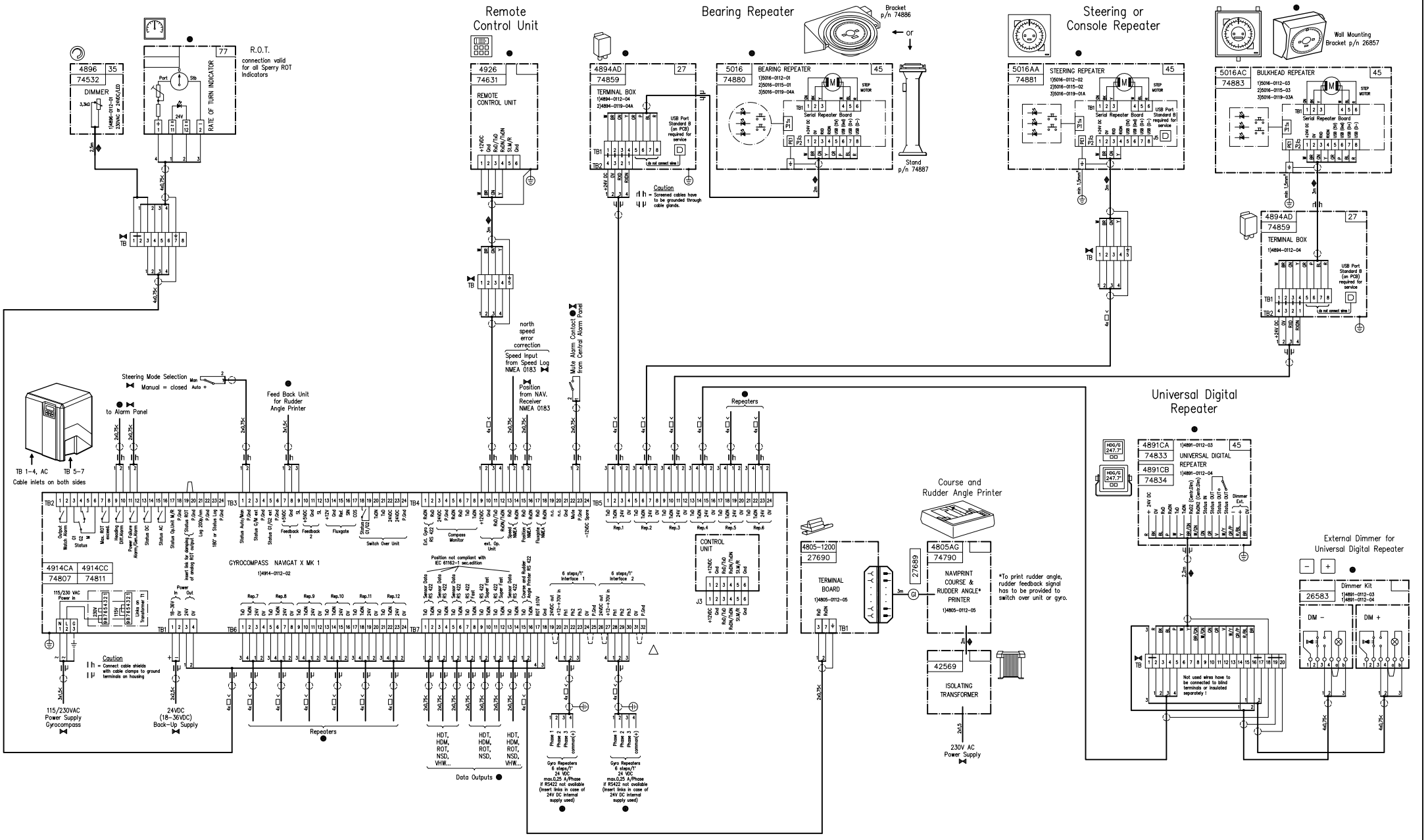
FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

SHEETS 1

© (NORTHROP GRUMMAN SPERRY MARINE 11.09.1998)


Remote Control Unit
Bearing Repeater
Steering or Console Repeater
Universal Digital Repeater
Course and Rudder Angle Printer
Bracket p/n 74886
or
Stand p/n 74887
Wall Mounting Bracket p/n 26857
4896 35 74532 DIMMER
77 R.O.T. connection valid for all Sperry ROT Indicators
RATE OF TURN INDICATOR
4926 74631 REMOTE CONTROL UNIT
4894AD 74859 TERMINAL BOX 1)4894-0112-04 2)4894-0119-04A
5016 74880 BEARING REPEATER 1)5016-0112-01 2)5016-0115-01 3)5016-0119-04A
5016AA 74881 STEERING REPEATER 1)5016-0112-02 2)5016-0115-02 3)5016-0119-01A
5016AC 74883 BULKHEAD REPEATER 1)5016-0112-03 2)5016-0115-03 3)5016-0119-03A
Serial Repeater Board
USB Port Standard B (on PCB) required for service
Do not connect wires
Caution
= Screened cables have to be grounded through cable glands.
Steering Mode Selection
Manual = closed
Auto
to Alarm Panel
Feed Back Unit for Rudder Angle Printer
north speed error correction
Speed input from Speed Log NMEA 0183
Position from NAV. Receiver NMEA 0183
Mute Alarm Contact from Central Alarm Panel
Repeaters
TB 1-4, AC
TB 5-7
Cable inlets on both sides
4914CA 74807 4914CC 74811
GYROCOMPASS NAVIGAT X MK 1
1)4914-0112-02
Position not compliant with IEC 61162-1 sec.edition
6 steps/1" Interface 1
6 steps/1" Interface 2
CONTROL UNIT
4805-1200 27690 TERMINAL BOARD 1)4805-0112-05
27689
4805AG 74790 NAVPRINT COURSE & RUDDER ANGLE* PRINTER 1)4805-0112-05
*To print rudder angle, rudder feedback signal has to be provided to switch over unit or gyro.
42569 ISOLATING TRANSFORMER
230V AC Power Supply
4891CA 74833 UNIVERSAL DIGITAL REPEATER 1)4891-0112-03
4891CB 74834 1)4891-0112-04
Not used wires have to be connected to blind terminals or insulated separately !
External Dimmer for Universal Digital Repeater
26583 Dimmer Kit 1)4891-0112-03 1)4891-0112-04
DIM -
DIM +
115/230VAC Power Supply Gyrocompass
24VDC (18-36VDC) Back-Up Supply
HDT, HDM, ROT, NSD, VHW...
Data Outputs
Gyro Repeaters 6 steps/1" 24 VDC max.0,25 A/Phase if RS422 not available (insert links in case of 24V DC internal supply used)
Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !
TYPE-NO
STOCK-NO
IDENT-NO
Insert links in case internal 24V DC for step repeaters is used; remove links in case external supply is used
Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²
REMARKS
1) Dimension Drawing
2) Wiring Diagram
3) Macro/Xref Drawing
● If required
< Screened Cable
(AA) all cables marked with letters are Sperry Marine Supply of max. 3m length

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. ⋈ Components Owner- or Yard-Delivery
3. ◆ Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

Mod. input deleted + Reader layout	B	983 803	16.08.13	Lau
ACAD	A1	–	08.10.10	Lau
initial	A	981 900	29.07.10	Lau
DESCRIPTION	REV	ECO-No.	DATE	NAME

Standard drawing

	Date	Name
DRAWN	09.07.2010	Lau
DESIGN	09.07.2010	Gerslig
CHD ECO	15.07.2010	Dietmann

4914-0253-15B_SCH.DWG

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE: GYROCOMPASS SYSTEM NAVIGAT X MK1

DRAWING No. 4914-0253-15 /B

SHEET 1 SHEETS 1

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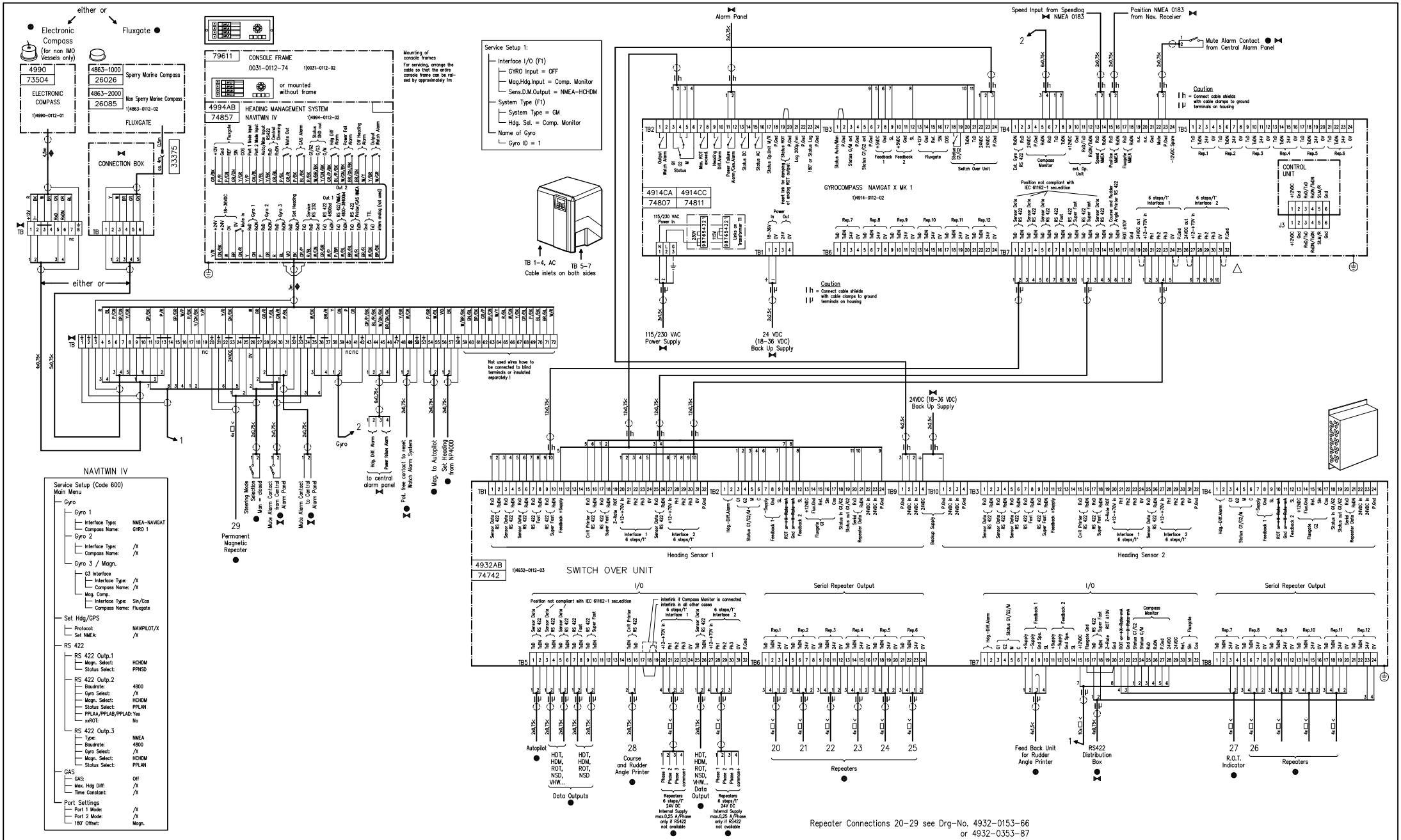
Each modification of this drawing requires the approval from NORTHROP GRUMMAN SPERRY MARINE in written form.



Insert links in case internal 24V DC for step repeaters is used; remove links in case external supply is used

Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²

REMARKS
1) Dimension Drawing
2) Wiring Diagram
3) Macro/Xref Drawing
● If required
< Screened Cable
all cables marked with letters are Sperry Marine Supply of max. 3m length

Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !

TYPE-NO
STOCK-NO
IDENT-NO

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. Components Owner- or Yard-Delivery
3. Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

DESCRIPTION	REV	ECO-No.	DATE	NAME
Correction+Reader Layout	D	983 803	16.08.13	Lau
Setup updated	C	982 974	24.02.11	Lau
corrections – ACAD	B	982 923	21.10.10	Lau
initial	A	981 900	15.02.10	Geisler

Standard drawing

	Date	Name
DRAWN	15.02.2010	Geisler
DESIGN	15.02.2010	Gemig
CHD ECO	19.04.2010	Malhotra

4932-0353-670_SUI.DWG

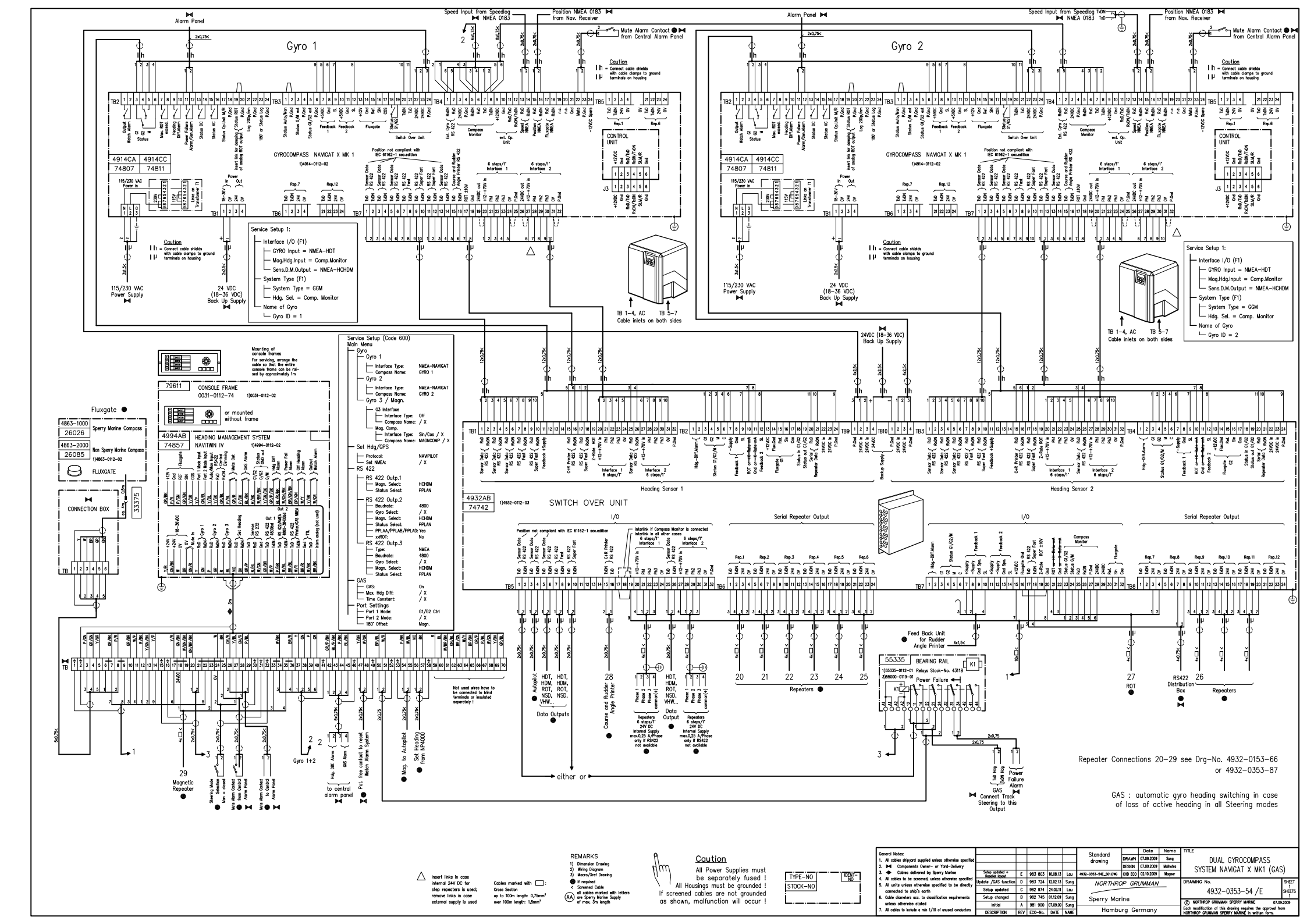
NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE: SINGLE GYROCOMPASS / TMC SYSTEM NAVIGAT X MK1

DRAWING No. 4932-0353-67 /D

SHEET 1 SHEETS 1

© NORTHROP GRUMMAN SPERRY MARINE 15.02.2010
Each modification of this drawing requires the approval from NORTHROP GRUMMAN SPERRY MARINE in written form.


Gyro 1
Gyro 2
Alarm Panel
Speed Input from Speedlog NMEA 0183
Position NMEA 0183 from Nav. Receiver
Mute Alarm Contact from Central Alarm Panel
Caution
= Connect cable shields with cable clamps to ground terminals on housing
4914CA 4914CC
74807 74811
GYROCOMPASS NAVIGAT X MK 1
1)4914-0112-02
CONTROL UNIT
Service Setup 1:
Interface I/O (F1)
GYRO Input = NMEA-HDT
Mag.Hdg.Input = Comp.Monitor
Sens.D.M.Output = NMEA-HCHDM
System Type (F1)
System Type = GGM
Hdg. Sel. = Comp. Monitor
Name of Gyro
Gyro ID = 1
Gyro ID = 2
115/230 VAC Power Supply
24 VDC (18–36 VDC) Back Up Supply
TB 1–4, AC TB 5–7 Cable inlets on both sides
Heading Sensor 1
Heading Sensor 2
Service Setup (Code 600)
Main Menu
Gyro
Gyro 1
Interface Type: NMEA–NAVIGAT
Compass Name: GYRO 1
Gyro 2
Interface Type: NMEA–NAVIGAT
Compass Name: GYRO 2
Gyro 3 / Magn.
G3 Interface
Interface Type: Off
Compass Name: / X
Mag. Comp.
Interface Type: Sin/Cos / X
Compass Name: MAGNCOMP / X
Set Hdg/GPS
Protocol: NAVIPILOT
Set NMEA: / X
RS 422
RS 422 Outp.1
Magn. Select: HCHDM
Status Select: PPLAN
RS 422 Outp.2
Baudrate: 4800
Gyro Select: / X
Magn. Select: HCHDM
Status Select: PPLAN
PPLAA/PPLAB/PPLAD: Yes
xxRDT: No
RS 422 Outp.3
Type: NMEA
Baudrate: 4800
Gyro Select: / X
Magn. Select: HCHDM
Status Select: PPLAN
GAS
GAS: On
Max. Hdg Diff: / X
Time Constant: / X
Port Settings
Port 1 Mode: G1/G2 Ctrl
Port 2 Mode: / X
180° Offset: Magn.
Mounting of console frames
For servicing, arrange the cable so that the entire console frame can be raised by approximately 1m
79611 CONSOLE FRAME 0031-0112-74 1)0031-0112-02
or mounted without frame
4994AB 74857 HEADING MANAGEMENT SYSTEM NAVITWIN IV 1)4994-0112-02
Fluxgate
4863–1000 26026 Sperry Marine Compass
4863–2000 26085 Non Sperry Marine Compass 1)4863-0112-02
FLUXGATE
CONNECTION BOX
33375
4932AB 74742 1)4932-0112-03
SWITCH OVER UNIT
I/O
Serial Repeater Output
Position not compliant with IEC 61162–1 sec.edition
Interlink If Compass Monitor is connected
interlink in all other cases
6 steps/1° Interface 1
6 steps/1° Interface 2
Feed Back Unit for Rudder Angle Printer
55335 BEARING RAIL
1)55335-0112-01 Relays Stock-No. 43118
3)55000-0119-01
Power Failure
Autopilot
Course and Rudder Angle Printer
Repeaters
ROT
RS422 Distribution Box
Data Outputs
either or
Magnetic Repeater
Gyro 1+2
Mag. to Autopilot
Set Heading from NAVIGO
Pot. free contact to reset Watch Alarm System
Hdg. Diff. Alarm
GAS Alarm
to central alarm panel
Steering Mode Selection Non = closed
Mute Alarm Contact from Central Alarm Panel
Mute Alarm Contact to Central Alarm Panel
Power Failure Alarm
GAS Connect Track Steering to this Output
Repeater Connections 20–29 see Drg–No. 4932–0153–66 or 4932–0353–87
GAS : automatic gyro heading switching in case of loss of active heading in all Steering modes
Not used wires have to be connected to blind terminals or insulated separately !
Insert links in case internal 24V DC for step repeaters is used; remove links in case external supply is used
Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²
REMARKS
1) Dimension Drawing
2) Wiring Diagram
3) Macro/Xref Drawing
● If required
< Screened Cable
(AA) all cables marked with letters are Sperry Marine Supply of max. 3m length
Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !
TYPE–NO
STOCK–NO
IDENT–NO

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. ⋈ Components Owner– or Yard–Delivery
3. ◆ Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

DESCRIPTION	REV	ECO–No.	DATE	NAME
Setup updated + Reader layout	E	983 803	16.08.13	Lau
Update /GAS function	D	983 724	12.02.13	Sung
Setup updated	C	982 974	24.02.11	Lau
Setup changed	B	982 745	01.12.09	Sung
initial	A	981 900	07.09.09	Sung

Standard drawing

	Date	Name
DRAWN	07.09.2009	Sung
DESIGN	07.09.2009	Malhotra
CHD ECO	02.10.2009	Wagner

4932–0353–54E_351.DWG

TITLE: DUAL GYROCOMPASS SYSTEM NAVIGAT X MK1 (GAS)

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

DRAWING No. 4932–0353–54 /E
SHEET 1 SHEETS 1

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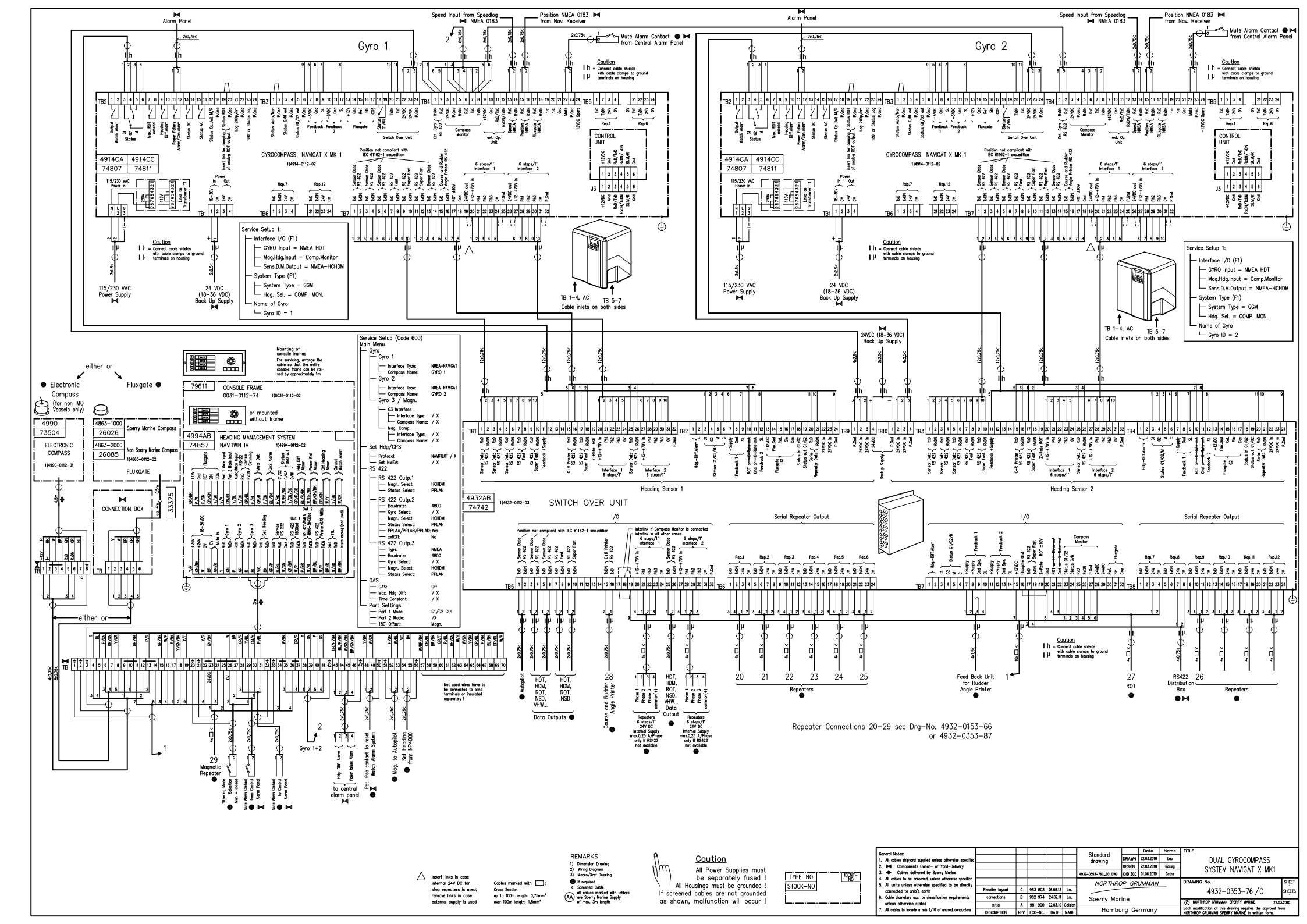
Gyro 1
Gyro 2
Alarm Panel
Speed Input from Speedlog NMEA 0183
Position NMEA 0183 from Nav. Receiver
Mute Alarm Contact from Central Alarm Panel
Caution
Connect cable shields with cable clamps to ground terminals on housing
4914CA 4914CC
74807 74811
GYROCOMPASS NAVIGAT X MK 1
1)4914-0112-02
CONTROL UNIT
115/230 VAC Power In
Power Out
Position not compliant with IEC 61162-1 sec.edition
6 steps/1° Interface 1
6 steps/1° Interface 2
Service Setup 1:
Interface I/O (F1)
GYRO Input = NMEA HDT
Mag.Hdg.Input = Comp.Monitor
Sens.D.M.Output = NMEA-HCHDM
System Type (F1)
System Type = GGM
Hdg. Sel. = COMP. MON.
Name of Gyro
Gyro ID = 1
Gyro ID = 2
115/230 VAC Power Supply
24 VDC (18–36 VDC) Back Up Supply
TB 1–4, AC Cable inlets on both sides
TB 5–7
Heading Sensor 1
Heading Sensor 2
either or
Electronic Compass
(for non IMO Vessels only)
Fluxgate
4990
73504
ELECTRONIC COMPASS
1)4990-0112-01
4863-1000
26026
Sperry Marine Compass
4863-2000
26085
Non Sperry Marine Compass
1)4863-0112-02
FLUXGATE
CONNECTION BOX
33375
79611
CONSOLE FRAME
0031-0112-74
1)0031-0112-02
or mounted without frame
Mounting of console frames
For servicing, arrange the cable so that the entire console frame can be raised by approximately 1m
4994AB
74857
HEADING MANAGEMENT SYSTEM
NAVITWIN IV
1)4994-0112-02
Service Setup (Code 600)
Main Menu
Gyro
Gyro 1
Gyro 2
Gyro 3 / Magn.
G3 Interface
Mag. Comp.
Set Hdg/GPS
RS 422
RS 422 Outp.1
RS 422 Outp.2
RS 422 Outp.3
GAS
Port Settings
4932AB
74742
1)4932-0112-03
SWITCH OVER UNIT
I/O
Serial Repeater Output
Interlink If Compass Monitor is connected
Interlink in all other cases
Autopilot
HDT, HDM, ROT, NSD, VHW...
Data Outputs
Course and Rudder Angle Printer
Repeaters 6 steps/1° 24V DC Internal Supply max.0,25 A/Phase only if RS422 not available
Data Output
Repeaters
Feed Back Unit for Rudder Angle Printer
ROT
RS422 Distribution Box
Repeater Connections 20–29 see Drg–No. 4932–0153–66 or 4932–0353–87
29 Magnetic Repeater
Steering Mode Selection Mon. + Coded
Mute Alarm Contact from Central Alarm Panel
Mute Alarm Contact to Central Alarm Panel
Hdg. Diff. Alarm
Power Failure Alarm
Rly. free contact to reset Watch Alarm System
Mag. to Autopilot
Set Heading from NP4000
Gyro 1+2
Not used wires have to be connected to blind terminals or insulated separately !
REMARKS
1) Dimension Drawing
2) Wiring Diagram
3) Macro/Xref Drawing
If required
Screened Cable
all cables marked with letters are Sperry Marine Supply of max. 3m length
Insert links in case internal 24V DC for step repeaters is used; remove links in case external supply is used
Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²
Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !
TYPE–NO
STOCK–NO
IDENT–NO
General Notes:
1. All cables shipyard supplied unless otherwise specified
2. Components Owner– or Yard–Delivery
3. Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors
Standard drawing
4932–0353–76C_351.DWG
Reseller layout C 983 803 26.08.13 Lau
corrections B 982 974 24.02.11 Lau
initial A 981 900 22.03.10 Geister
DESCRIPTION REV ECO–No. DATE NAME
DRAWN 22.03.2010 Lau
DESIGN 22.03.2010 Gaisig
CHD ECO 01.06.2010 Gothe
NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany
TITLE
DUAL GYROCOMPASS SYSTEM NAVIGAT X MK1
DRAWING No.
4932–0353–76 /C
SHEET 1
SHEETS 1
© NORTHROP GRUMMAN SPERRY MARINE 22.03.2010
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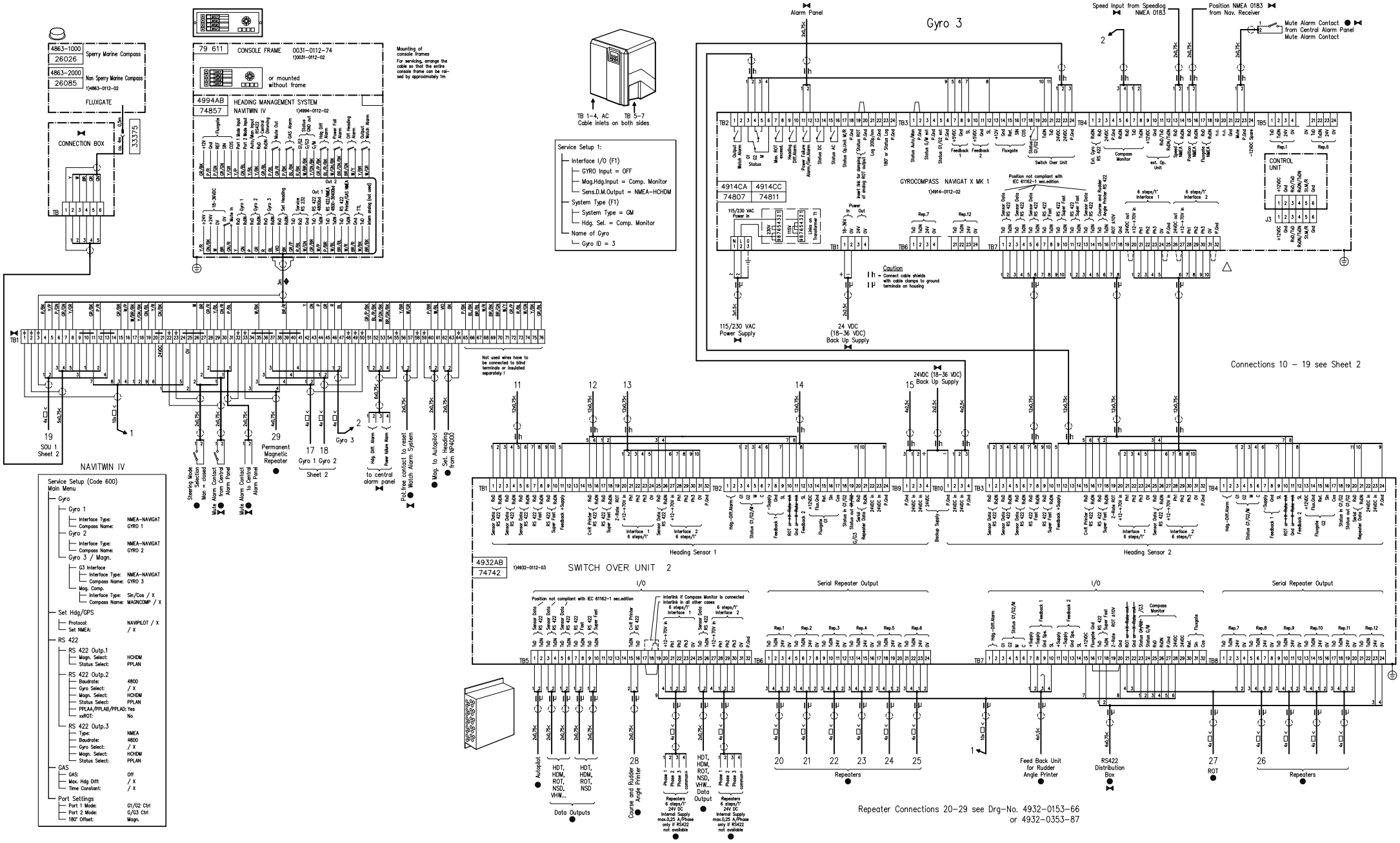

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. ⋈ Components Owner– or Yard–Delivery
3. ◆ Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

DESCRIPTION	REV	ECO–No.	DATE	NAME
initial	A	981 900	15.02.10	Geisler
corrections, ACAD	B	982 974	24.02.11	Lau
corrections	C	983 380	27.01.12	Sung
Correction+Reseller Layout	D	983 803	16.08.13	Lau

Standard drawing

	Date	Name
DRAWN	15.02.2010	Geisler
DESIGN	15.02.2010	Gemig
CHD ECO	22.02.2010	Malhotra

4932–0353–68D_350.DWG

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE: TRIPLE GYROCOMPASS SYSTEM NAVIGAT X MK1

DRAWING No. 4932–0353–68 /D

SHEET 1 SHEETS 2

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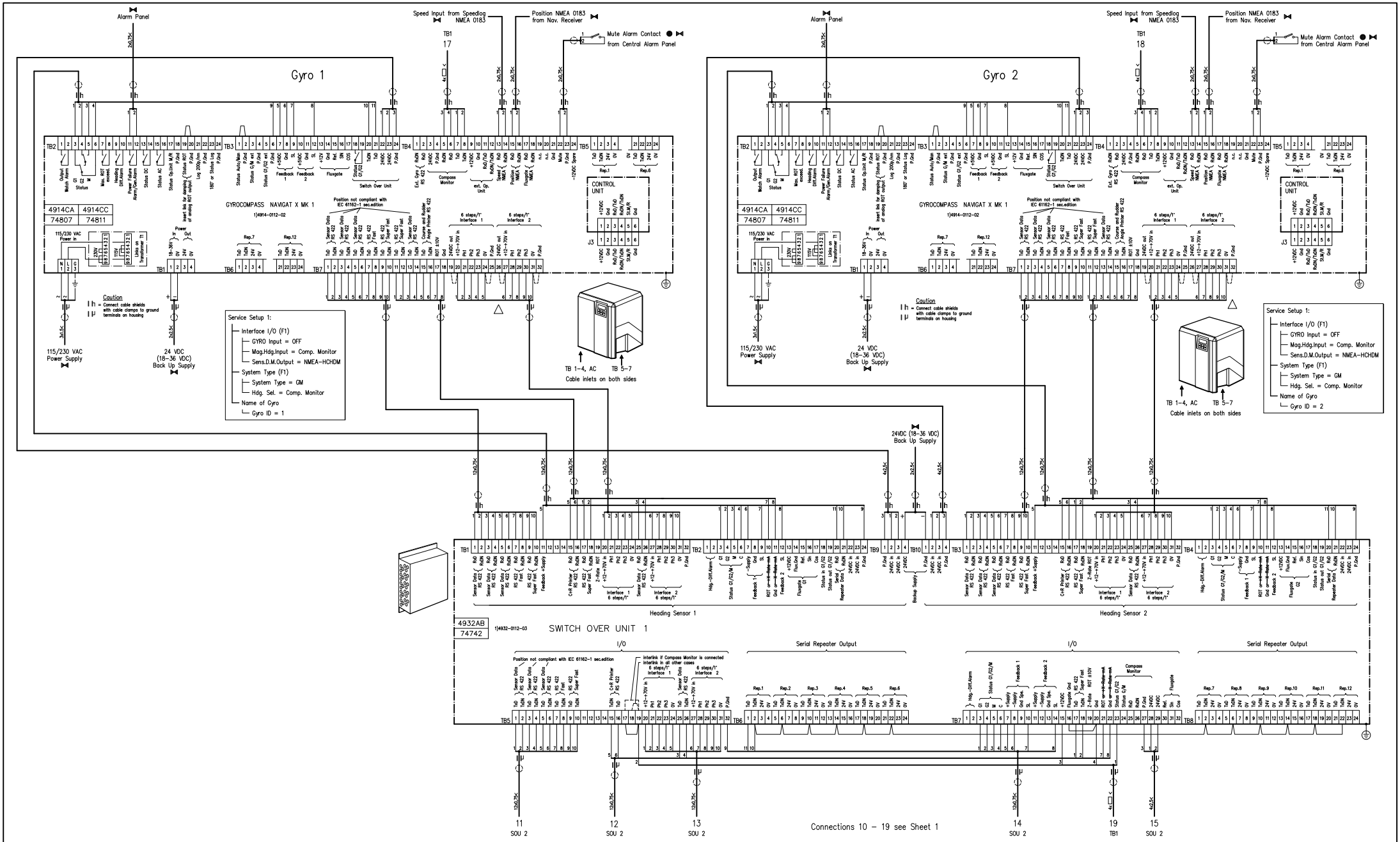
Each modification of this drawing requires the approval from NORTHROP GRUMMAN SPERRY MARINE in written form.



Insert links in case internal 24V DC for step repeaters is used; remove links in case external supply is used

Cables marked with □: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²

REMARKS
1) Dimension Drawing
2) Wiring Diagram
3) Macro/Xref Drawing
● If required
< Screened Cable
all cables marked with letters (AA) are Sperry Marine Supply of max. 3m length

Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !

TYPE–NO
STOCK–NO
IDENT–NO

General Notes:
1. All cables shipyard supplied unless otherwise specified
2. ⋈ Components Owner– or Yard–Delivery
3. ◆▶ Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors

DESCRIPTION	REV	ECO–No.	DATE	NAME
initial	A	981 900	15.02.10	Geisler
corrections	C	983 380	27.01.12	Sung
Setup updated	B	982 974	24.02.11	Lau
Correction+Reader Layout	D	983 803	16.08.13	Lau

Standard drawing

	Date	Name
DRAWN	15.02.2010	Geisler
DESIGN	15.02.2010	Gerwig
CHD ECO	22.02.2010	Malhotra

4932–0353–680_502.DWG

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE: TRIPLE GYROCOMPASS SYSTEM NAVIGAT X MK1

DRAWING No. 4932–0353–68 /D

SHEET 2 SHEETS 2

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Sperry Marine

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